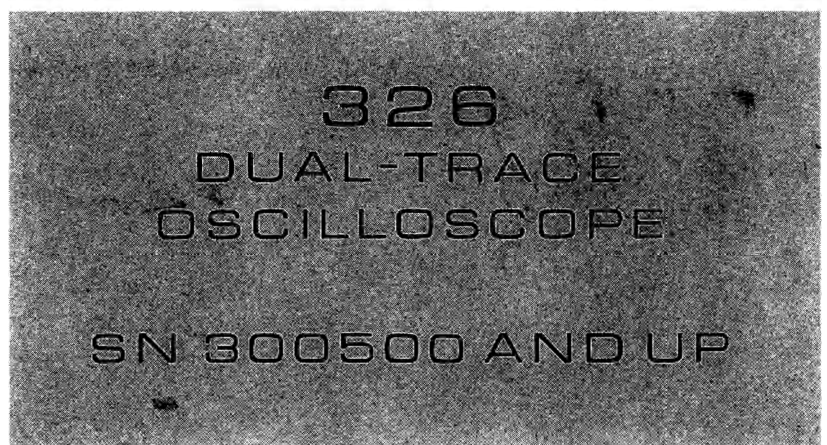


**TEKTRONIX®**



## INSTRUCTION MANUAL

Tektronix, Inc.  
P.O. Box 500  
Beaverton, Oregon 97005

Serial Number \_\_\_\_\_



## WARRANTY

All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

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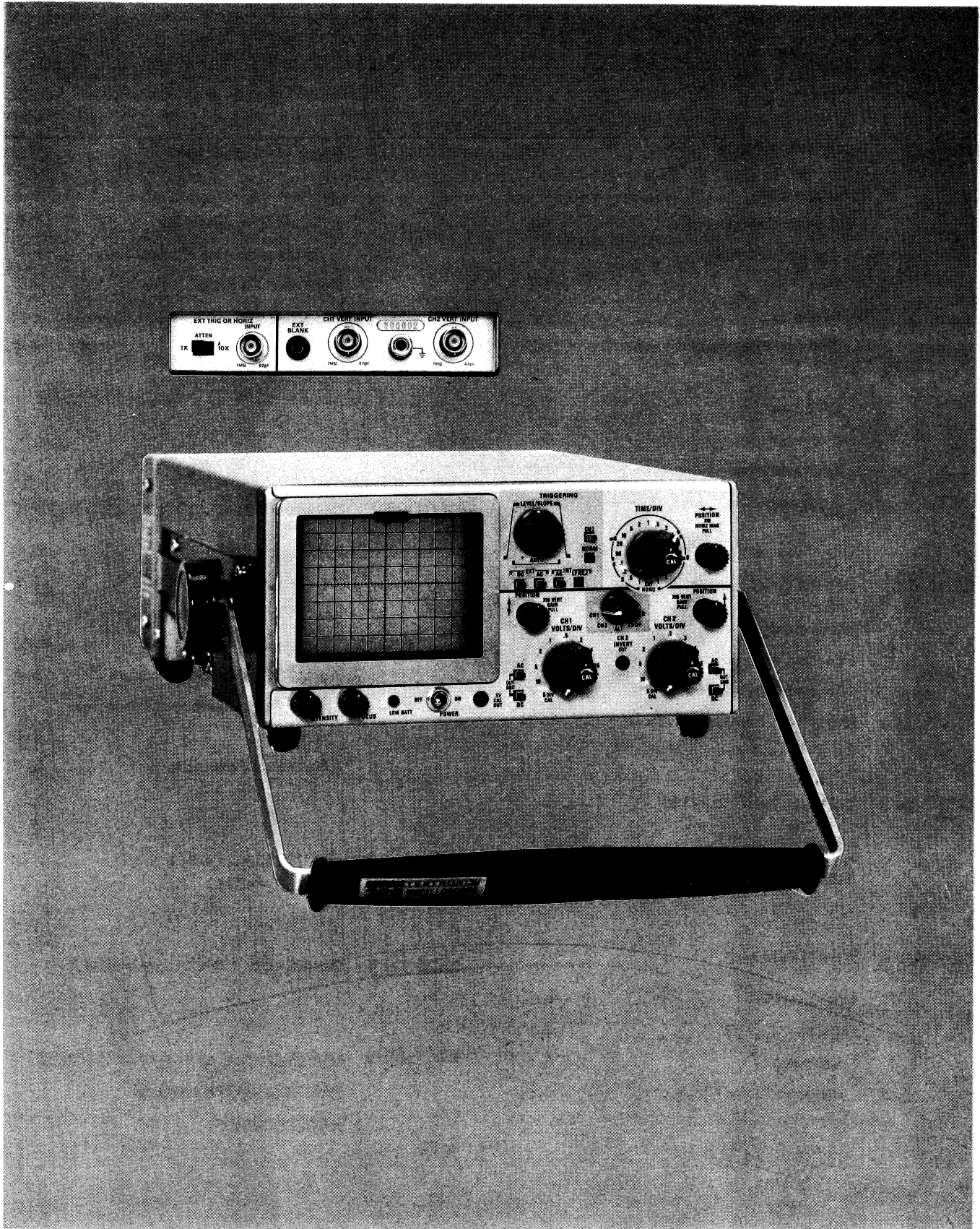
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# TABLE OF CONTENTS

<b>SECTION 1</b>	<b>SPECIFICATION</b>	<b>Page</b>	<b>SECTION 4</b>	<b>MAINTENANCE (cont)</b>	<b>Page</b>
	Introduction	1-1		Recalibration	4-1
	Electrical Characteristics	1-1		Troubleshooting Aids	4-1
	Vertical Amplifier	1-1		Troubleshooting Equipment	4-1
	Time Base	1-2		Replacement Parts	4-1
	Calibrator	1-2		Assembly and Component Replace-	
	External Horizontal Input	1-2		ment	4-2
	External Blanking	1-2		Instrument Repackaging	4-6
	CRT Display	1-3			
	Power Source	1-3			
	Internal Battery Supply	1-3			
	Environmental	1-3	<b>SECTION 5</b>	<b>PERFORMANCE CHECK/ADJUSTMENT</b>	
<b>SECTION 2</b>	<b>OPERATING INSTRUCTIONS</b>			Introduction	5-1
	Power Source Requirements	2-1		Test Equipment Required	5-1
	Function of External Controls,			Short-Form Performance Check	
	Connectors, and Indicators	2-3		and Index	5-2
	Instrument Familiarization	2-5		Performance Check Procedure	5-4
				Short-Form Adjustment Procedure	
				and Index	5-12
				Adjustment Procedure	5-13
<b>SECTION 3</b>	<b>CIRCUIT DESCRIPTION</b>		<b>SECTION 6</b>	<b>ELECTRICAL PARTS LIST</b>	
	Introduction	3-1			
	Basic Block Description	3-2			
<b>SECTION 4</b>	<b>MAINTENANCE</b>		<b>SECTION 7</b>	<b>DIAGRAMS, CIRCUIT BOARDS</b>	
	Introduction	4-1			
	General	4-1	<b>SECTION 8</b>	<b>MECHANICAL AND REPACKAGING</b>	
	Cleaning	4-1		<b>PARTS ILLUSTRATIONS</b>	
	Semiconductor Checks	4-1		<b>ACCESSORIES</b>	



SONY/TEKTRONIX 326 Oscilloscope.

# 326 SPECIFICATION

## Introduction

The SONY/TEKTRONIX 326 Oscilloscope is a solid-state portable instrument that combines small size and light weight with the ability to make precision waveform measurements.

A dual-trace DC to 10 MHz vertical system provides calibrated deflection factors from 0.01 Volt/Div to 10 Volts/Div (0.001 Volt/Div minimum with reduced frequency response).

The trigger circuit provides stable triggering over the full vertical bandwidth. A 300 ns delay line in the vertical system allows the operator to view the portion of the waveform on which triggering occurs.

The horizontal deflection system provides calibrated sweep rates from 1  $\mu$ s/Div to 1 s/Div. A 10X magnifier extends the sweep rate to 0.1  $\mu$ s/Div.

The 326 can be operated from internal battery, an external DC source, or from the AC line (with battery charger attached).

The following electrical characteristics apply over an ambient temperature range of +20°C to +30°C (+68°F to +86°F). Warmup time for the accuracies given is approximately 10 seconds.

## CHARACTERISTICS

### VERTICAL AMPLIFIER

#### Deflection Factor

Ranges: 10 mV/Div to 10 V/Div in X1 Gain and 1 mV/Div to 1 V/Div in X10 Gain. 10 steps in a 1-2-5 sequence. Accuracy within 3% over the calibrated range.

Variable: Variable between calibrated deflection factor settings. Extends the highest deflection factor to at least 25 V/Div.

Attenuator Compensation: +1%, -1%, or less, 0°C to +55°C (+32°F to +131°F). +2%, -2%, or less, -15°C to 0°C (+5°F to +32°F).

#### Frequency Response

Bandwidth (Variable Volts/Div at CAL, 4 division reference) direct coupled: 1X Gain, DC to at least 10 MHz (upper -3 dB point) with the P6049A Probe. Capacitively coupled, 4 division reference: from 10 Hz or less (lower -3 dB point) at all deflection factors. 1 Hz or less with the P6049A Probe.

Step Response (risetime), 4 division step input: 36 ns or less in X1 Gain and 72 ns or less with X10 Gain.

Aberrations: +2.5%, -2.5% with total of 4% or less in all modes except ADD ALG. +3%, -3% with total of 6% or less in ADD ALG Mode.

#### Input

Maximum Voltage: 500 volts direct coupled (DC + peak AC) or capacitively coupled DC voltage.

Resistance: 1 M $\Omega$ , within 2%, direct and 10 M $\Omega$ , within 2%, with the P6049A Probe.

Capacitance: 47 pF within 4 pF direct and 13.5 pF or less with the P6049A Probe.

#### Amplifier

Linear dynamic range in Added Mode: Equal to or greater than 8 times the Volts/Div setting for 10% distortion.

Common-Mode Rejection: At least 20:1 at 2 MHz for a common-mode signal of 80 mV peak-to-peak, Volts/Div set at 10 mV and CH 2 set for maximum CMRR at 50 kHz and 10 mV.

#### DC Drift

With Time (short term): 0.2 div or less during any minute within the first hour after a 10 second warmup (with temperature and line voltage constant).



## Specification—326 (SN 300500-up)

### Chopped Mode

Repetition Rate: 110 kHz within 20%.

Duty Cycle: 40% to 60%.

Resistance: Approximately 10 k $\Omega$ .

## TIME BASE

### Sweep Time/Div

Calibrated Range: 1 s/Div to 1  $\mu$ s/Div in 19 steps in a 1-2-5 sequence. 10X magnifier extends the displayed sweep time to 0.1  $\mu$ s/Div.

Accuracy, X1 Gain: within 3% over the center eight graticule divisions from 1  $\mu$ s/Div to 0.2 s/Div, increasing to 4% from 0.5 s/Div to 1 s/Div.

X10 Gain: within 5% over any 2 division interval within the center eight graticule divisions 1.0  $\mu$ s/Div to 20 ms/Div. Increasing to 6% at 0.5  $\mu$ s/Div, 0.1  $\mu$ s/Div, 0.1 s/Div, and 50 ms/Div.

Variable: at least 2.5:1.

### Trigger

Internal: DC to 10 MHz on signals causing 1.0, or more, division of vertical deflection and to approximately 1.0 MHz on signals causing 0.3 division of vertical deflection.

External: DC to 10 MHz on signals of 500 mV or more, decreasing to approximately 1.0 MHz on signals of 150 mV.

Coupling: AC attenuates signals below 30 Hz; LF REJ attenuates signals below 50 kHz.

External Level Range: Atten at X1, +0.8 V to -0.8 V; Atten at X10, +8 V to -8 V.

Maximum Input Voltage: 300 V (DC + peak AC).

## CALIBRATOR

### Output

Voltage Accuracy (into a load of 1 M $\Omega$  or greater): 0.5 V, within 1% from +20°C to +30°C (+68°F to +86°F), decreasing to within 2% from -15°C to +20°C (+5°F to +68°F) and +30°C to +55°C (+86°F to +131°F).

## EXTERNAL HORIZONTAL INPUT

### Deflection Factor

Horiz Mag X10, Ext Atten 1X: 15 mV/Div to 25 mV/Div.

Horiz Mag off, Ext Atten 1X: 150 mV/Div to 250 mV/Div.

Horiz Mag X10, Ext Atten 10X: 150 mV/Div to 250 mV/Div.

Horiz Mag off, Ext Atten 10X: 1.5 V/Div to 2.5 V/Div.

### Bandwidth

DC to at least 200 kHz (upper -3 dB point).

### Dynamic Range

At least 20 divisions (+2.5 volts to -2.5 volts) with EXT TRIG OR HORIZ ATTEN switch set to X10, and EXT HORIZ Variable control set to CAL.

### Variable Range

At least 10:1.

## EXTERNAL BLANKING

### Sensitivity

DC Coupled: +5 volts to +20 volts.

### Usable Frequency Range

To approximately 100 kHz.

### Input Voltage

Maximum: 50 V (DC + peak AC).

## CRT DISPLAY

### Graticule Area

8 X 10 one-fourth inch divisions.

### Geometry

Within 0.1 division.

## POWER SOURCE

### Power Line

Voltage Ranges (Battery Charger): 90 V to 136 V and 180 V to 272 V.

Frequency (Battery Charger): 48 Hz to 440 Hz.

Maximum Power Consumption: 35 VA, with 136 volt AC line, a 10 MHz 6-division signal displayed, full intensity, and full charge rate.

### External DC

Voltage Range: +9 V to +32 V.

Maximum Power Consumption: 12 watts, with 10 MHz, 6-division signal displayed and full intensity.

## INTERNAL BATTERY SUPPLY

### Battery

9 size C, 1.5 AH NiCd cells.

### Charge Time

Full Charge (instrument off): at least 16 hours.

### Operating Time

1.5 to 4 hours, depending on control settings and temperature: +20°C to +25°C (+68°F to +77°F) charge temperature and +10°C to +30°C (+50°F to +86°F) operating temperature;

15  $\mu$ A or less cathode current

Calibrator Waveform displayed: 4 hours or greater.

6 divisions of 10 MHz signal displayed: 1.8 hours or greater.

315  $\mu$ A cathode current (full intensity)

Calibrator waveform displayed: 2.5 hours or greater.

6 divisions of 10 MHz signal displayed: 1.5 hours or greater.

## ENVIRONMENTAL

### Temperature

Nonoperating: -40°C to +75°C (-40°F to +167°F).

Operating: -15°C to +55°C (+5°F to +131°F).

Charging: 0°C to +40°C (+32°F to +104°F).

### Altitude

Nonoperating: to 50,000 feet.

Operating: to 15,000 feet. Maximum allowable ambient temperature decreases by 1°C/1000 feet from 5,000 feet to 15,000 feet.

## MECHANICAL

### Construction

Chassis	Aluminum Alloy
Panel	Aluminum Alloy with Anodized Finish
Cabinet	Blue Vinyl-Coated Aluminum

### Dimensions and Weights

Height	4.0 in	10.2 cm
Width with handle	8.7 in	22.2 cm
Depth, handle not extended		
With charger	15.0 in	38.1 cm
Without charger	12.2 in	31.0 cm
Depth, handle extended		
With charger	18.2 in	46.2 cm
Without charger	15.8 in	40.1 cm
Net weight without accessories		
With charger	≈13 lb	≈5.9 kg
Without charger	≈10 lb	≈4.5 kg
Domestic shipping weight	≈21 lb	≈9.5 kg
Export-packed weight	≈29 lb	≈13.1 kg





# OPERATING INSTRUCTIONS

## General

This section explains power source requirements, describes the functions and uses of controls and connectors, and gives first time and general operating information.

## POWER SOURCE REQUIREMENTS

### General

The 326 may be powered from either the internal Battery Pack (nine NiCd cells connected in series) or on an external DC voltage source ranging from +9 volts to +32 volts.

The internal battery pack is removable and may be charged (while in the instrument or externally) by the battery charger.

Typical operating time from a fully charged battery pack is approximately 4 to 5 hours. Actual operating time varies with sweep rate, the displayed signal frequency and amplitude, display brightness, and the ambient temperature during cell charge.

### Internal Battery Operation

Sliding the power source switch to the BATT OR AC ADPT position connects the internal battery to the 326 front-panel POWER switch. Internal battery powered operation is not possible with the source switch in the EXT DC POWER position.

Internal battery powered operation should be discontinued after the LOW BATT lamp starts flashing. The battery should immediately be put on charge or the battery pack should be replaced with a fully charged pack.

If the internal battery-powered operation is continued after the LOW BATT lamp starts flashing, the trace will disappear in a short time and the LOW BATT lamp will stop flashing; damage to some of the NiCd cells might result.

If the cells must be removed from the battery pack, use the following procedure:

## WARNING

*The cells used in the battery pack are capable of delivering a large amount of energy in a short time. Rings, watch bands and other metallic items that might short circuit the battery can rapidly become hot enough to cause severe burns.*

### Cell Removal (see Fig. 2-1)

1. Remove the three machine screws from the left edge of the Battery Pack front panel.
2. Remove two machine screws from the rear (same edge as those removed from the front) panel.

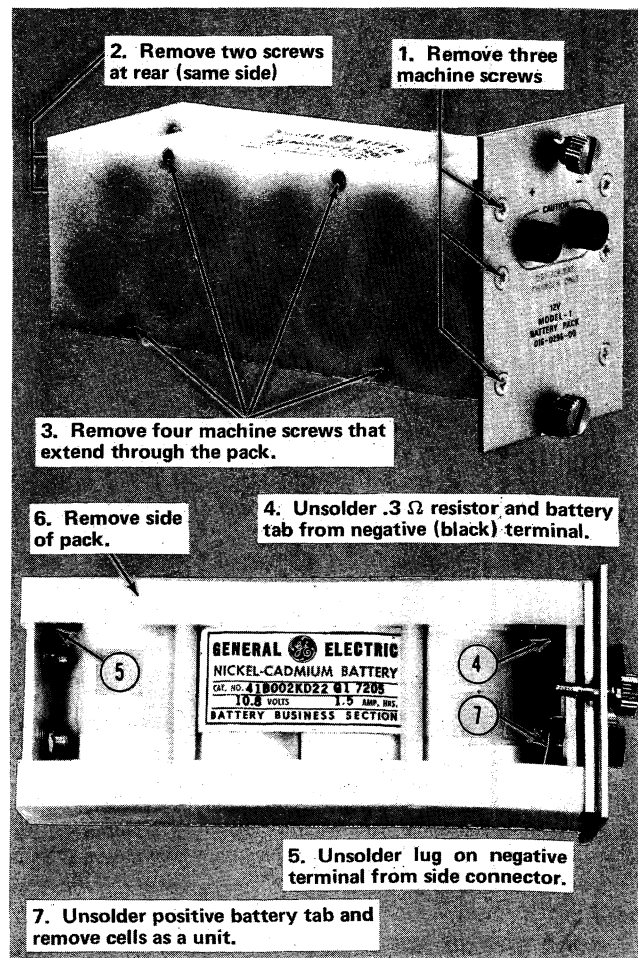


Fig. 2-1. Battery Pack cell removal.

## Operating Instructions—326 (SN 300500-up)

3. Remove the four machine screws that extend through the pack.
4. Carefully unsolder the copper strap and bare wire from the connector lug at the front end.
5. Unsolder connector lug from side-panel conductor at the rear of the pack.
6. Lift the side away from the pack.
7. Unsolder the copper strap from the negative connector lug.
8. Carefully lift the cells (as a unit) away from the case. Do not allow the copper cell tabs to contact each other while removing cells.

### External DC-Powered Operation

The instrument can be powered by an external DC source between +9 and +32 volts. The Power Source switch must be in the EXT DC POWER position and the external supply must be connected to the + (red) and – (black) connectors on the rear panel of the instrument. The external DC source will not charge the internal battery. For some Serial Numbers, the LOW BATT indicator lamp does not function during External DC powered operation. If incorrect operation occurs, check the external DC power source.

### CAUTION

*Applying external DC power with the polarity reversed will cause the Power Regulator fuse, F870 on the Horizontal circuit board, to open.*

### Battery Charger

The internal battery pack may be charged either within or outside the instrument. When charging the battery pack inside the instrument the battery charger attaches to the rear of the instrument.

Instrument operation can be continued while the internal battery is charging or a spare battery pack can be charged while the instrument operates on internal battery.

The battery pack may be charged in the instrument while the instrument is operating from an AC source.

Slip-on connectors in the battery charger must be connected to match the line voltage to be used. The internal fuse must be changed when the AC line voltage is changed. Use a 0.4 A fuse for 115-volt operation and a 0.2 A fuse for 230-volt operation. See Fig. 2-2.

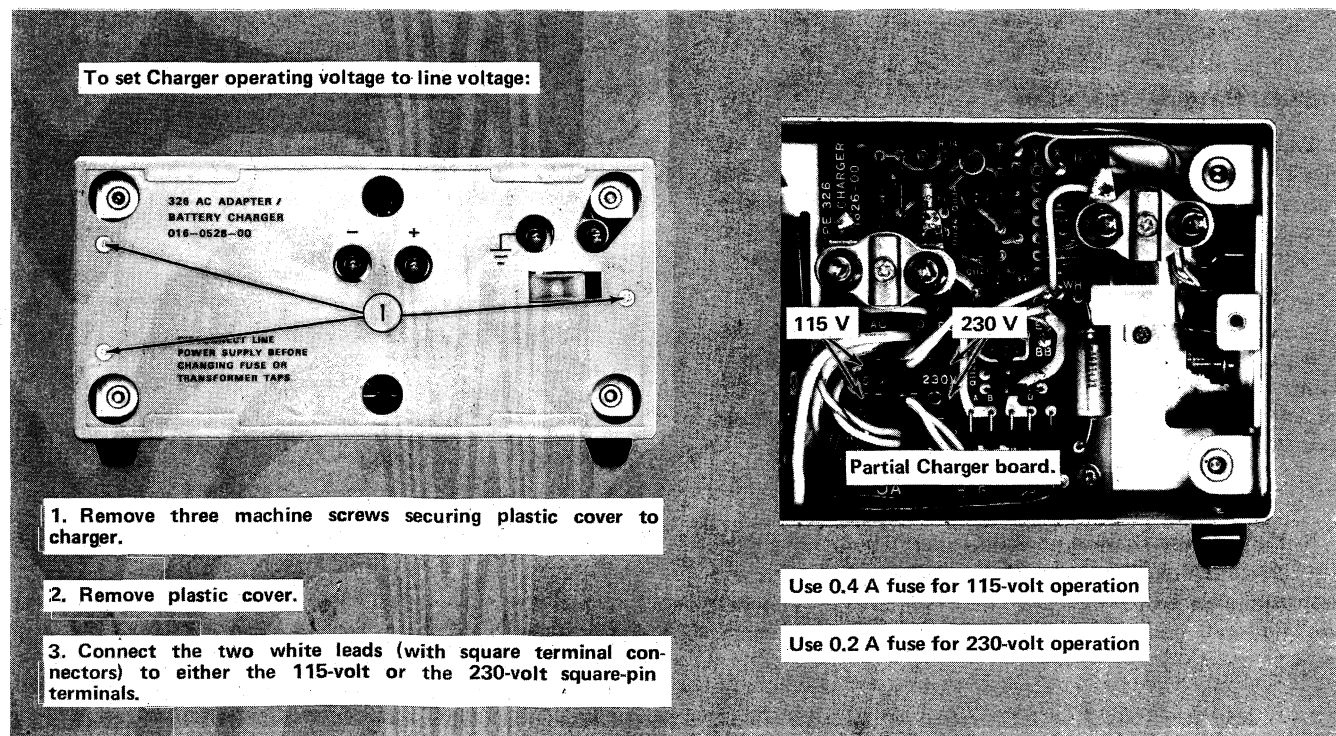


Fig. 2-2. Location of line-voltage selection terminals.

## Battery Charging

Although the battery contained in the 326 is charged before packaging, it should be recharged for 16 hours at FULL CHG rate before being put into service.

The charging characteristics of NiCd cells vary with cell temperature during charge. The energy delivered is inversely proportional to the cell temperature during the first three-fourths to seven-eighths of the full charge cycle.

If NiCd cells become reverse charged, their capacity for recharging can be impaired or destroyed. An imbalance between cells in a battery can develop during operation or during partial charging. It is possible for the imbalance to become so great that during discharge the weakest cells completely lose their charge and become reverse charged by the current from the charged cells.

To avoid reverse charging one or more cells, fully charge the battery after each discharge (16 hours) on FULL CHG. Although partial recharge is not recommended as a common practice, occasional recharges can be tolerated. About 30 to 45 minutes of operating time can be expected for each hour of charge.

In addition, the battery should be charged at the FULL CHG rate for 24 hours approximately once a month or

every 15 charge/discharge cycles. Once the battery has been fully charged, the charge rate should be set to TRICKLE. The trickle charge rate provides only enough current to offset the internal losses, and will keep the battery fully charged.

## FUNCTION OF EXTERNAL CONTROLS, CONNECTORS AND INDICATORS

### General

The controls, connectors, and indicators listed are contained on the external surfaces of the 326, and are used during routine oscilloscope operation. All other controls are inside the instrument covers and should be adjusted only during instrument calibration.

The external control, connector, and indicator nomenclature is shown in CAPITAL letters wherever it appears in this manual.

### Front Panel (see Fig. 2-3)

#### POWER ON-OFF

Two position toggle switch. Connects the oscilloscope circuitry to the power source. Does not affect battery charging.

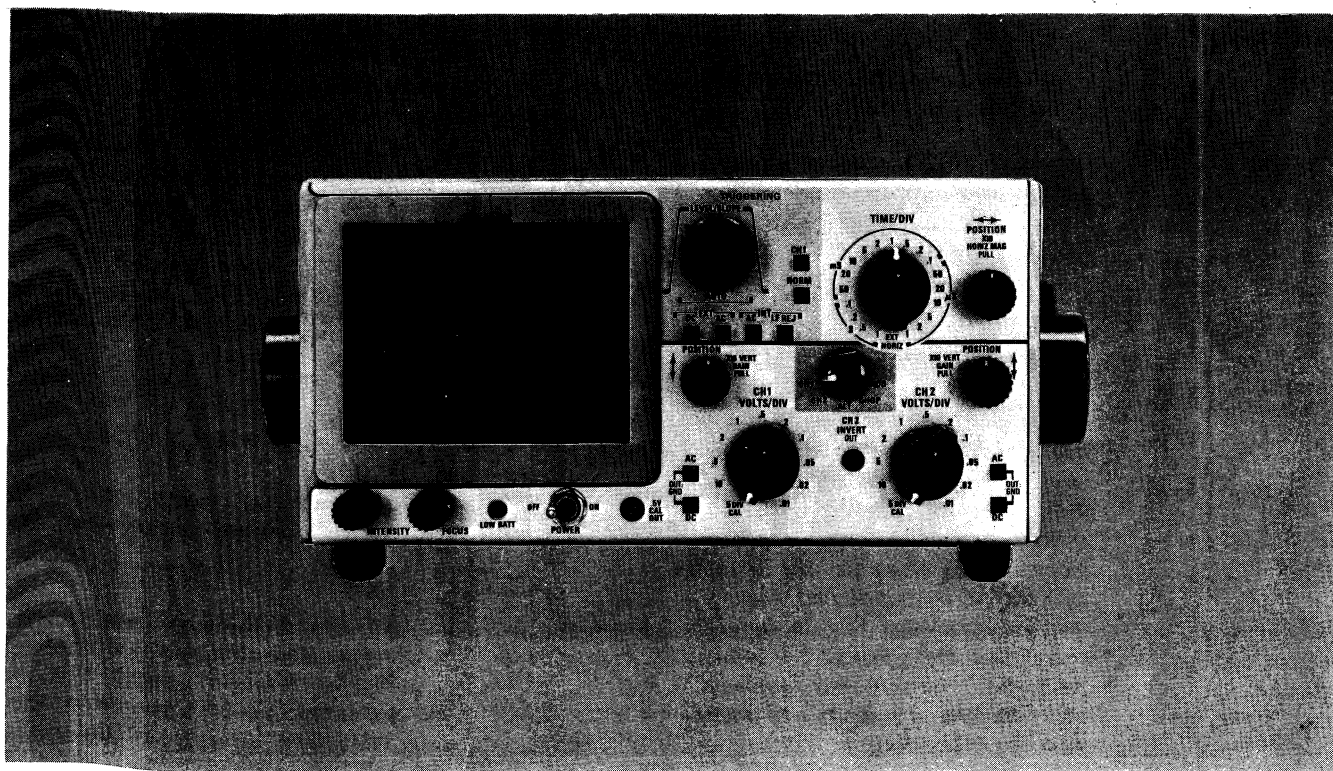


Fig. 2-3. 326 Front panel.



## Operating Instructions—326 (SN 300500-up)

LOW BATT	Indicator lamp. During battery operation, the lamp flashes to indicate that internal battery voltage is low. If the battery voltage is sufficiently low the lamp will stop flashing and the instrument will stop operating. To distinguish this condition from equipment failure, connect the charger at FULL CHG rate for a few minutes. Then disconnect the charger and check for oscilloscope operation and LOW BATT indicator lamp operation. (For some serial numbers the LOW BATT Indicator lamp does not function when External DC power source is used.)	Vert Position	Vertically adjusts the display position.
		X10 GAIN	Pull the POSITION control knob to increase the vertical gain by a factor of 10. Extends the calibrated deflection factor to 1 mV/Div. Bandwidth is reduced to 5 MHz.
		CH 2	VOLTS/DIV, Variable, input coupling switches, POSITION and X10 GAIN provide the same functions as those of CH 1.
		Mode Selector	
		CH 1	Displays channel 1 only.
		CH 2	Displays channel 2 only.
		ALT	Displays channel 1 and channel 2 alternately. When both channels are displayed, the channels are switched electronically during beam retrace interval.
		CHOP	Displays channel 1 and channel 2 simultaneously.
		ADD	Displays the algebraic sum of the signals applied to channels 1 and 2.
		CH 2 INVERT	Channel 2 display is inverted with the INVERT switch in the OUT position.
CH 1 VOLTS/DIV	Selects calibrated deflection factors from 0.1 Volts/Div to 10 Volts/Div (Variable in CAL position and X10 GAIN pushed in). When set to the 5 DIV CAL position, a 5-division square-wave calibrator signal is displayed.	TIME/DIV	Selects the horizontal sweep rate. Sweep rates are 1 $\mu$ s/DIV to 1 s/DIV in a 1-2-5 sequence, plus an EXT HORIZ position. In the EXT HORIZ position horizontal deflection depends on signal applied to the EXT HORIZ INPUT connector on the side panel.
Variable	Varies Volts/Div between calibrated steps. Range is at least 2.5X. The uncalibrated range is extended to 25 Volts/Div.		
CH 1 Input Coupling Switch			
AC	Capacitively couples the input signal to the input attenuator.		
GND	Grounds the input attenuator (both pushbuttons out) and connects the signal through 470 k $\Omega$ and 0.0185 $\mu$ F to ground.		
<p style="text-align: center;"><b>NOTE</b></p> <p><i>The GND configuration (both AC and DC buttons out) provides a precharge circuit. The input coupling capacitor charges to the DC level of the input signal. This precharge feature prevents offscreen deflection which occurs when connecting a signal to the input with the AC button pushed. Always use the precharge feature before connecting the signal to the input (with both buttons out, connect the signal to the input and then push the AC button).</i></p>			
DC	Couples the input signal directly to the input attenuator.	Variable	Varies the TIME/DIV between calibrated steps. Range is at least 2.5X. The uncalibrated sweep rate is extended to 2.5 s/Div. With the TIME/DIV selector in the EXT HORIZ position, the Variable control attenuates the external horizontal signal from 1X to 10X.

### NOTE

*For external sweep, the EXT Trigger Selector button must be pushed.*

**POSITION X10  
HORIZ MAG** Horizontally positions the display. Pull the POSITION X10 HORIZ MAG knob to increase the horizontal gain by a factor of 10 (the sweep expands from graticule center). X10 magnification extends the fastest displayed sweep rate to .1  $\mu$ s/DIV.

**EXT (pushbuttons)** Triggers the sweep from a trigger signal applied to the EXT HORIZ INPUT (side panel).

**AC** Capacitively couples the external trigger signal. Low frequency cutoff is about 30 Hz.

**DC** Triggers on DC level changes as well as AC signals.

**INT (pushbuttons)** Triggers the sweep on the signal applied to the Vertical Input(s).

**AC** Capacitively couples the internal trigger signal. Low frequency cutoff is about 30 Hz.

**LF REJ** Capacitively couples the internal trigger signal. Makes high frequency triggering more dependable by rejecting frequency components below about 50 kHz.

**CH 1-NORM  
(pushbuttons)** Selects the internal triggering source. NORM button selects an internal signal, dependent on the position of the Mode switch. CH 1 button selects Channel 1 only as the trigger source.

**LEVEL/SLOPE** Selects the level and slope of the displayed signal on which triggering occurs. In the fully ccw position, triggering is automatic on the positive-going (+) trigger signal. In the fully cw position, triggering is automatic on the negative-going (-) triggering signal. Between the two extreme positions the control selects the triggering level on either the + or - slope. AUTO triggering provides a baseline in the absence of triggering signal, but triggering is normal on recurrent signals.

**INTENSITY** Adjusts the display brightness. Display brightness affects battery operating time.

**FOCUS** Adjusts for a sharp, well defined trace. Interacts somewhat with the INTENSITY control.

**.5 V CAL OUT** Source of calibration square wave. 0.5 volts, peak to peak.

### Side Panel

#### EXT TRIG OR HORIZ

**INPUT** Apply external trigger or external horizontal input signal to this BNC connector.

**ATT X1-X10  
Switch** Selects attenuation factor (X1 or X10) for the external signal.

## INSTRUMENT FAMILIARIZATION

This procedure provides a means of quickly checking the operation of the 326.

### Preliminary

Preset the front-panel controls as follows:

LEVEL/SLOPE	+AUTO
AC-LF REJ	AC
CH 1-NORM	CH 1
TIME/DIV	1 ms
Variable	CAL
Horiz POSITION	midrange
X10 HORIZ MAG	pushed in
Mode	CH 1
CH 1 and CH 2	
VOLTS/DIV	5 DIV CAL
Variable	CAL
Input AC-DC	DC
Vertical POSITION	midrange
X10 GAIN	pushed in
INTENSITY	midrange
FOCUS	midrange

Set rear-panel EXT DC POWER-BATT OR AC ADPT switch to BATT OR AC ADPT.

### 1. Check Battery Charge Level

- Switch POWER switch to ON.

b. CHECK—The LOW BATT Indicator should not flash.

c. If LOW BATT Indicator flashes, charge the battery pack, replace the battery pack with a fully charged pack, or operate on an external DC supply. Proceed with the checkout.

d. The lower portion of the calibrator signal should appear within the graticule area. Adjust FOCUS and INTENSITY for suitable viewing. Vertically position the bottom of the display to the bottom graticule line. Horizontally position the start of the display to the first graticule line (left).

## 2. Check Vertical Deflection Factor

a. CHECK—The amplitude of the displayed square wave should equal 5 divisions.

b. Pull out the CH 1 X10 VERT GAIN control knob.

c. CHECK—The display amplitude should equal 5 divisions.

## 3. Check Probe Compensation

a. Connect a P6049A Probe to the CH 1 VERT INPUT connector. Set CH 1 VOLTS/DIV selector to .01 V, TIME/DIV to 0.5 ms, and Mode to CH 1.

b. Touch the probe tip to the CAL OUT jack and check the display for proper probe compensation (see Fig. 2-4).

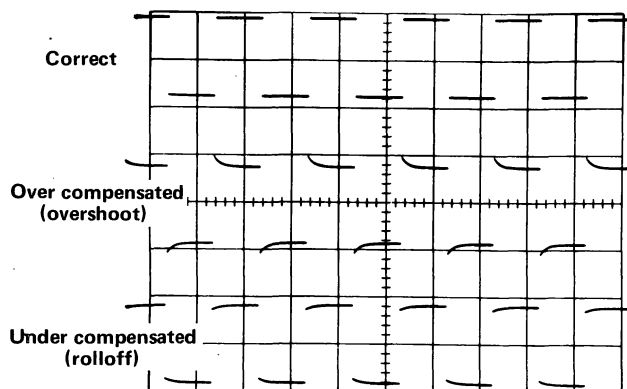


Fig. 2-4. Probe Compensation.

c. If necessary, adjust the probe compensation for the best front corner response to the square waves as shown in Fig. 2-4.

## 4. Check Trigger Sensitivity and Polarity

a. Set CH 1 VOLTS/DIV selector to 1 volt, TIME/DIV to 1 ms, push INT AC and CH 1 buttons. Pull out the CH 1 X10 VERT GAIN control and apply the CAL OUT signal to CH 1 VERT INPUT and to EXT TRIG OR HORIZ INPUT by means of patch cords.

b. Adjust the CH 1 VOLTS/DIV Variable control for a 3-division display amplitude.

c. CHECK—For stable triggering on the + slope and on the - slope of the displayed signal (turn the LEVEL/SLOPE control throughout its range and check for proper triggering). Check for stable triggering in both + AUTO and - AUTO.

d. Connect the CAL OUT signal to CH 2. Switch CH 2 VOLTS/DIV to 1 V, Mode to CH 2, and CH 1—NORM to NORM.

e. Adjust the CH 2 VOLTS/DIV Variable control for a 3-division display amplitude.

f. CHECK—For stable triggering on the + slope and on the - slope of the displayed signal, including the + AUTO and - AUTO positions.

g. Reconnect the CAL OUT signal to both CH 1 VERT INPUT and EXT TRIG OR HORIZ INPUT.

h. Switch Mode to CH 1, TRIGGERING to EXT AC, CH 1—NORM to CH 1.

i. CHECK—For stable triggering on the + slope and - slope, including the + AUTO and - AUTO positions.

## 5. Check External Horizontal

### NOTE

*In the Ext Horiz mode, the internal sweep is disabled and the CRT beam is unblanked. Consequently, a brighter than normal stationary spot will appear on the CRT face unless an external sweep is applied. The INTENSITY setting should be changed to reduce the brightness level consistent with good viewing.*



a. Apply the CAL OUT signal to the EXT TRIG OR HORIZ INPUT connector using a patch cord.

b. Set the EXT TRIG OR HORIZ ATTEN to 1X.

c. Set the TIME/DIV to EXT HORIZ and TRIGGERING Coupling to EXT AC.

d. Check for two spots separated by approximately 2.5 divisions.

e. Set the EXT TRIG OR HORIZ ATTEN to 10X. Horizontally center the display.

f. Note that the distance between the two spots decreases by a factor of 10.

g. Pull the X10 HORIZ MAG. Position horizontally as necessary to keep the display approximately centered.

h. Note that the distance between spots increases by a factor of approximately 10.

### Charging the Battery (Battery Pack out of the Instrument)

Plug the battery charger banana plugs into the battery pack banana jacks, being sure that the polarity is correct (mount the charger in the same position relative to the

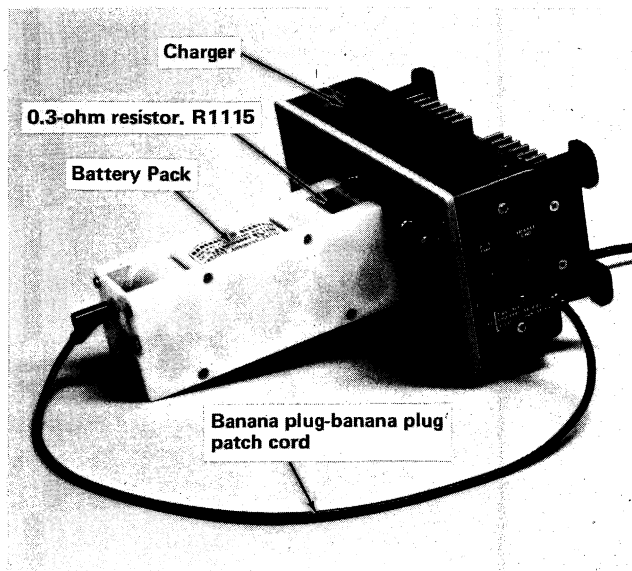


Fig. 2-5. Ground connection required to charge Battery Pack outside of instrument.

battery pack that it would be in if charging the battery pack in the instrument).

Connect a banana-banana patchcord from the negative (gnd) battery pack output terminal to the negative (gnd) external DC supply banana jack. See Fig. 2-5.

Plug the AC power cord into the charger and connect to the power line. Set the FULL CHG—TRICKLE switch to FULL CHG.



# CIRCUIT DESCRIPTION

## Introduction

This section of the manual contains a description of the circuitry used in the 326 Oscilloscope. A brief description of the instrument block diagram (preceding the foldout circuit schematics) is followed by a somewhat more detailed description of the individual blocks. Since the Power Regulator contains unique circuits, additional detail is provided.

If more information is desired on the commonly used circuits, refer to the following textbooks:

TEKTRONIX Circuit Concepts Books (order from your local TEKTRONIX Field Office or representative).

Cathode Ray Tubes, TEKTRONIX Part Number 062-0852-01.

Horizontal Amplifier Circuits, TEKTRONIX Part Number 062-1144-00.

Oscilloscope Trigger Circuits, TEKTRONIX Part Number 062-1056-00.

Power Supply Circuits, TEKTRONIX Part Number 062-0888-01.

Sweep Generator Circuits, TEKTRONIX Part Number 062-1098-01.

Vertical Amplifier Circuits, TEKTRONIX Part Number 062-1145-00.

Phillip Cutler, "Semiconductor Circuit Analysis", McGraw Hill, New York, 1964.

Lloyd P. Hunter, "Handbook of Semiconductor Electronics", second edition, McGraw Hill, New York, 1962.

Millman and Taub, "Pulse, Digital, and Switching Waveforms", McGraw Hill, New York, 1965.

## BLOCK DIAGRAM DESCRIPTION

### Instrument Block

The block diagram shows only the basic interconnections between individual blocks (see the foldout Block Diagram preceding the Schematic foldouts at the rear of the manual).

Signals applied to the vertical inputs are applied to the Vertical Preamp through the input coupling selector switch and the input step attenuators.

The Vertical Preamps contain gain, balance, and positioning controls as well as controls for setting the CRT vertical deflection plate DC levels.

A five division calibration signal is introduced into each channel via the input attenuators.

Signal is picked off at channel 1 preamp output for use as triggering signal.

The two vertical channels are switched electronically by the channel switching multi and gating diodes to provide five modes of operation: CH 1, CH 2, ALT, CHOP, and ADD.

Signal is picked off ahead of the delay line to provide trigger signal from whichever signal is being gated through to the output amplifier.

A 300 ns delay line provides sufficient signal delay to the CRT vertical deflection plates to allow observation of the transition which triggers the sweep.

The Output Amplifier provides high frequency compensation, and the current capability to drive the vertical deflection plates.

The Trigger Preamp selects the trigger source and amplifies the signal selected to a level compatible with the trigger generator input.

## Circuit Description—326 (SN 300500-up)

The trigger source (either the signal from the Trigger Preamp or the EXT TRIG) and the method of coupling are selected in the Trigger Generator. The trigger signal selected is coupled to a DC comparator amplifier to select the point on the signal at which triggering occurs. A switch in the comparator output selects trigger polarity. The signal is then shaped in the Schmitt multi and is coupled to the Sweep Generator to start the sweep voltage runup.

The Sweep Generator is a Miller integrator (runup) which provides a linear sawtooth voltage to the horizontal amplifier. A gate-amplifier circuit provides signal to the CRT to blank the trace during the retrace interval.

The Horizontal Amplifier contains adjustable components to set horizontal X1 Gain, X10 Gain, and positional registration in the magnified mode. The output circuitry provides drive to the CRT horizontal deflection plates.

The Power Regulator derives all of the regulated operating voltages from the DC source voltage (internal battery or external DC source). Adjustments are provided to set the CRT beam accelerating potential, focus, beam intensity, and the + and - 5-volt supply levels.

The Battery Charger circuit provides current either for charging the battery in about 16 hours or a trickle charge which just offsets the internal losses of a fully charged battery. An internal adjustment sets the charge current level.

## BASIC BLOCK DESCRIPTION

### Introduction

This section describes briefly each of the basic circuits. The description of each block is keyed to the circuit schematic (foldout at rear of manual), i. e., (2) indicates schematic No. 2, CH 1 Vertical Preamplifier.

### Ch 1 Vertical Preamplifier (2)

**Input Coupling.** Determines the method of coupling the signal to the amplifier input (AC—DC—GND).

**Attenuators.** Conventional frequency compensated step attenuators which maintain the input RC at 1 M $\Omega$  and 47 pF in each of the 10 switch positions.

**Input.** CR30 through CR33 prevent overdrive to the input FET, Q31A. R36 permits adjustment for any differences in the characteristics of Q31A and Q31B, which are electrically and thermally paired.

The first amplifier stage is a feedback amplifier consisting of the paraphase configuration Q41A and Q41B and the common-base section Q51-Q52 and Q53-Q59. R41 (X10 Vert Gain) adjusts the gain in the X10 switch (S40) position. R37 (Var Volts/Div Bal) adjusts Q41A and Q41B collector loads to prevent display shift as the VOLTS/DIV Variable is rotated throughout its range.

A push-pull emitter follower, Q55-Q57 drives the push-pull amplifier Q61-Q71. X1 Gain calibration and Volts/Div Variable are adjusted in the common-emitter circuit and display vertical position is adjusted in the collector circuits.

Q81-Q91-Q88-Q99 is a push-pull feedback amplifier in which the upper and lower deflection plate DC levels are adjusted.

Q95 and Q98 supply CH 1 signal to the triggering selector circuit.

**Calibrator (shown on schematic (1)).** The calibrator (an astable multi, Q1 and Q9, and a precision voltage divider) provide a 0.5-volt square wave to the front-panel CAL OUT jack, and to the Input FET via the 5 DIV CAL position of each (CH 1 and CH 2) attenuator switch.

**CH 2 Vertical Preamplifier (diagram (4)).** Same as CH 1 Vertical Preamplifier except for Trigger Pickoff and Calibrator.

**Vertical Switching and Output (5).** Q333-Q343-Q355, a multivibrator with several operating modes, provides channel switching by gating the signal through the appropriate diodes in the switching matrix (CR311 through CR313 and CR315 through CR318). The operating modes (selected by the Mode switch) are:

CH 1. +5 volts is applied to Q333 base divider resistor, R342, and to CR316-CR317, blocking CH 2, gating only CH 1 through to the Output Amplifier.

CH 2. Applies +5 volts to Q343 base divider resistor, R332, and to CR311-CR312, blocking CH 1, gating only CH 2 through to the Output Amplifier.

CHOP. Applies +5 volts to the junction of R335-R345. The switching circuit operates as an astable (free running) multi at a 110 kHz rate, alternately gating CH 1 and CH 2 into conduction. Since the switching rate is fixed (not dependent on trigger signal) both signals are displayed simultaneously on the viewing screen. A signal is taken

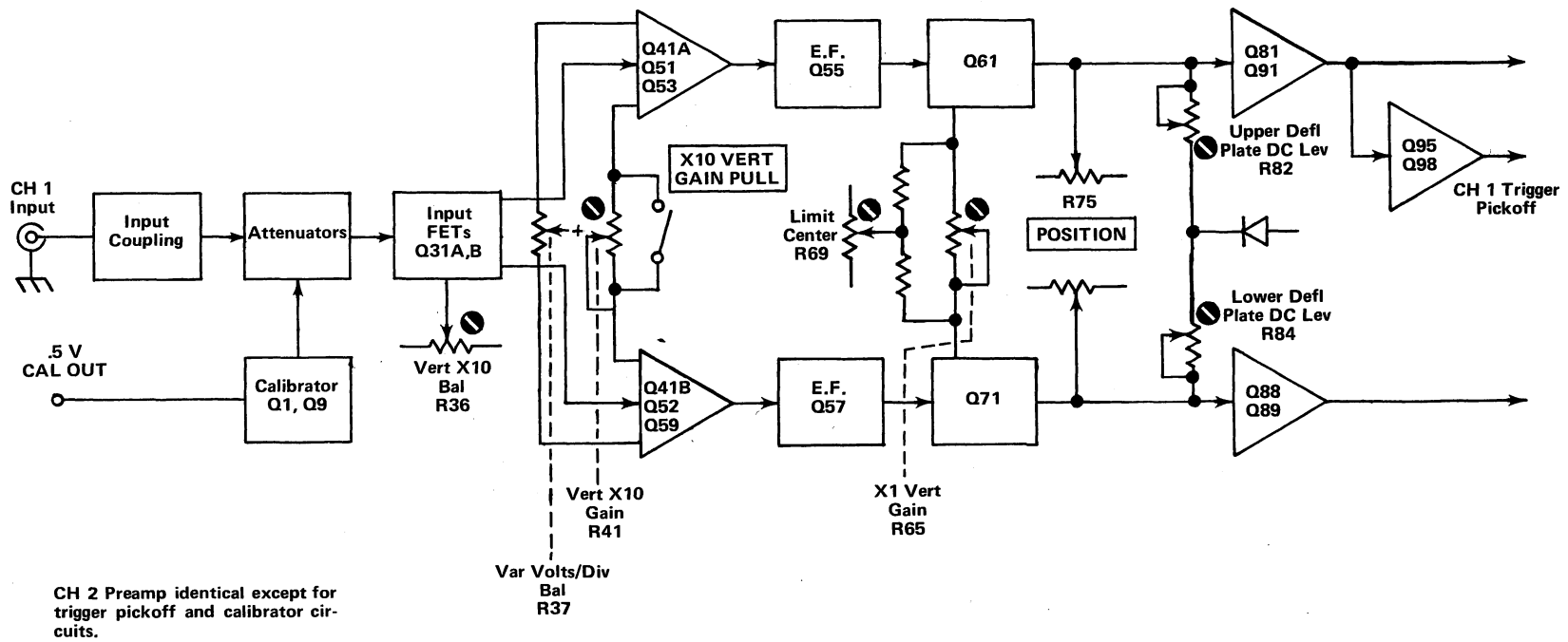


Fig. 3-1. CH 1 Vertical Preamplifier (2)



**Fig. 3-2. Vertical Switching and Output Amplifier (5)**

from the junction of C335-C345, amplified in Q361, and fed to the blanking circuit via CR668, (7), to blank the CRT beam during the switching interval.

**ALT.** Collector voltage supply is connected to Q351 via R350. Trigger signal from the Alt Trigger Source, (6), is connected to the steering diodes, CR335 and CR345. The channel switched on depends on the last previous condition of the multi (which side was turned on). Each incoming trigger switches the multi, turning one set of channel switching diodes on and turning the other set off. Channel 1 and Channel 2 are displayed alternately.

**ADD ALG. +5** volts is applied to the junction of R370-R380, gating both channels through to the Output Amplifier, displaying the algebraic sum of the two signals.

The amplifier following the gating is a common-base pushpull amplifier (Q376-Q386) driving the 300 ns delay line. Norm trigger is picked off at Q386, amplified in Q392 and fed to the Trigger Source switch, (6).

The feedback amplifier Q410-Q415, Q420-Q425, is followed by the high frequency compensation network. Common-base stage Q416-Q426 feeds the Output feedback amplifier, Q432-Q437-Q462-Q464 and Q434-Q458-Q472-Q474.

Amplifier Q448-Q452-Q454 provides deflection plate current boost for high frequency signals.

**Trigger Preamplifier.** Trigger source (CH 1 ONLY or NORM) is selected by S500, amplified by feedback amplifier Q505-Q510, and fed to the Trigger Generator, (6).

**Trigger Generator.** S540 (TRIGGERING SOURCE-COUPLING) selects trigger from either the Trigger Preamplifier, (6), or the EXT TRIG OR HORIZ INPUT connector (side panel). Signal is passed via a voltage limiting network to FET Q545, through switching (part of Trigger and part of TIME/DIV switches) and fed to a DC comparator amplifier, Q552-Q556, where the incoming trigger signal is compared to a DC level to set the point on the trigger signal at which triggering occurs. Trigger polarity is determined by the position of the switch in the collector circuits of Q552-Q556.

Q570 and Q580, a Schmitt multi shapes the trigger signal (square wave out) which is differentiated at the Sweep Generator, (7), input.

Trigger switch S560 also switches in the appropriate components to cause the trigger generator to act as a free running multi in the AUTO position of the LEVEL/SLOPE control. The free running multi provides a trace in the absence of trigger signal.

**Unblanking and Sweep Generator.** Differentiated trigger signal, applied to the trigger gating circuit, Q611-Q630-Q636-Q638-CR620-CR640-CR628, provides signal to gate the Miller Integrator, (7).

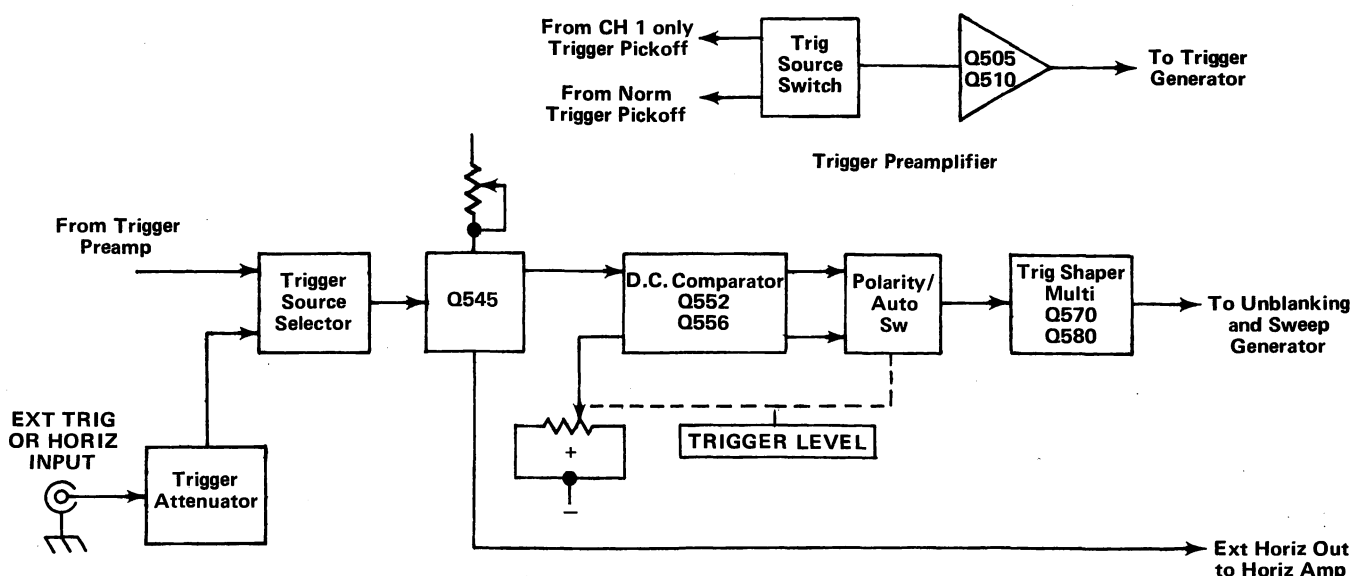


Fig. 3-3. Trigger Generator (6)



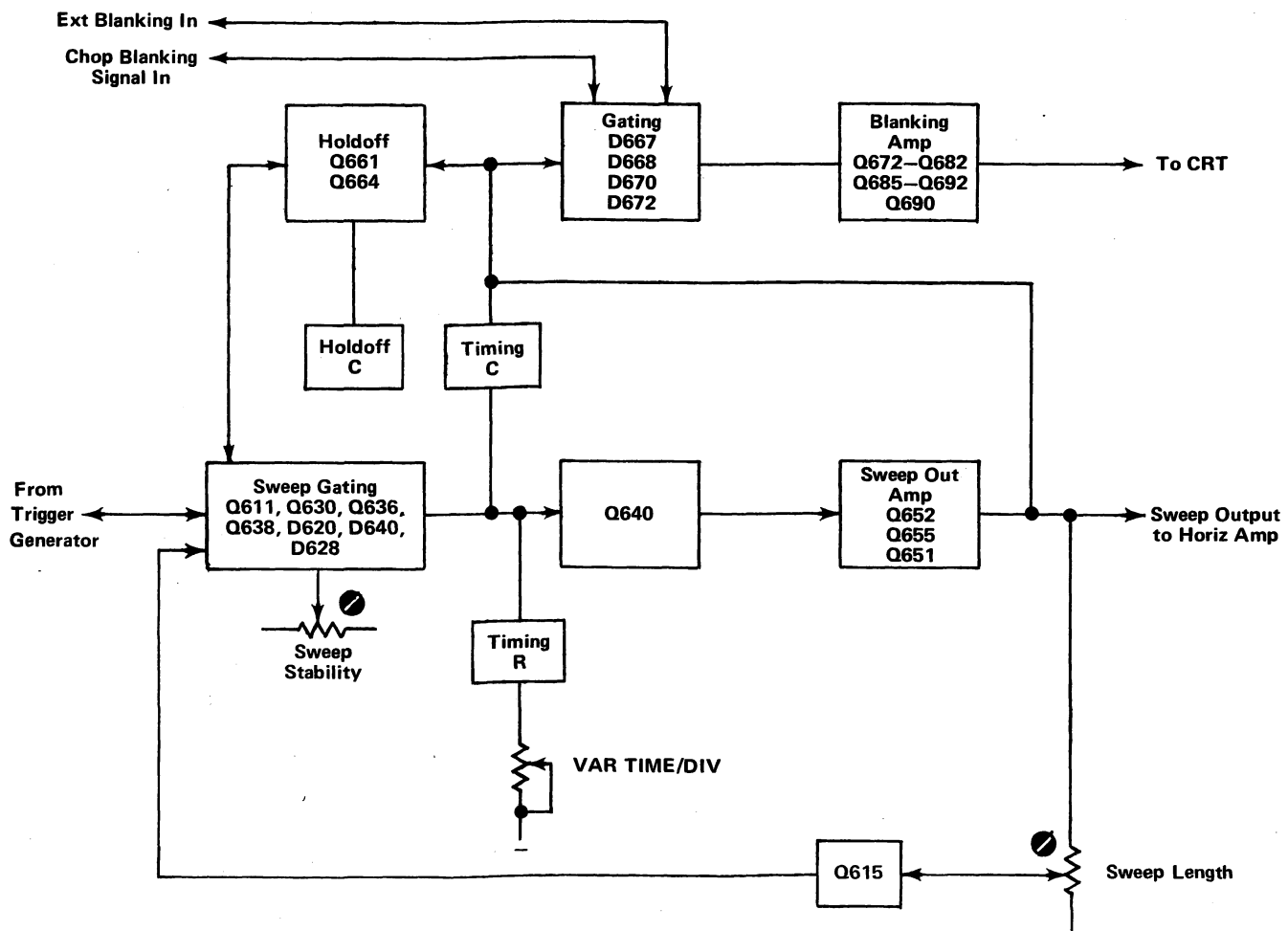


Fig. 3-4. Unblanking and Sweep Generator (7)

Output from the Miller runup is amplified in the Sweep Output Amplifier. The output signal is fed back to Q640 through the timing capacitor and timing resistor to set the sweep rate. Output is also fed back via the sweep length control, R618, to the gating circuit to end the sweep. The output also supplies signal to the holdoff circuit, Q611-Q664, to block incoming trigger signals until the sweep has ended and the sweep circuitry ready to start another sweep.

Blanking signal is selected from one of three points; sweep output, EXT BLANK connector, or from the chopped blanking signal from the Vertical Switching circuit, (5).

The blanking circuit, Q672-Q682-Q685-Q692-Q696, provides CRT beam blanking during retrace and during switching interval in Chopped Mode.

**Horizontal Amplifier.** Signal from either the Sweep Output, (7), or External Horizontal input is selected by the TIME/DIV switch. The input selector circuit contains adjustments for Sweep Start, Sweep Linearity, and Sweep Cal, (9).

The feedback amplifier Q726-Q732-Q738-Q740, contains components in the feedback loop to set the X10 Mag Gain and X10 Mag Registration. R708 adjusts horizontal display position.

Common-base amplifier, Q741, drives the inverter, Q744-Q746, which drives the Output amplifiers, Q756-Q758-Q748 and Q770-Q772-Q778.

**Power Regulator Circuit.** DC is supplied to the regulator through the ON-OFF switch and fuse, F870.

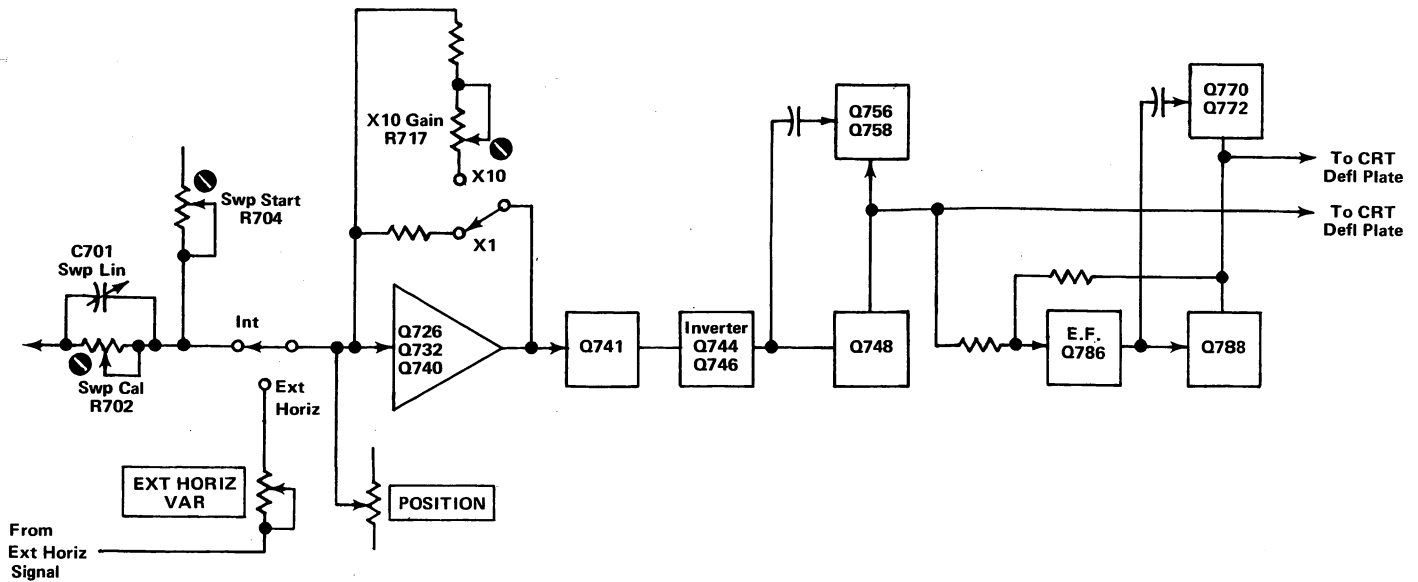


Fig. 3-5. Horizontal Amplifier (9)

A low battery voltage indicator circuit flashes the front-panel LOW BATT lamp when the applied DC level drops below +9.75 volts.

The start circuit supply provides operating potential to the start multi until the power supply is operating.

Initially, the start multi provides a pulse to the turn-on circuit, which provides turn-on bias to the current driver circuit, gating current into T970 transformer primary. The current in T980 primary produces a secondary voltage which is connected to the turn-off circuit. When the T980 secondary current reaches a predetermined level the turn-off circuit reverse biases the current driver, rapidly termi-

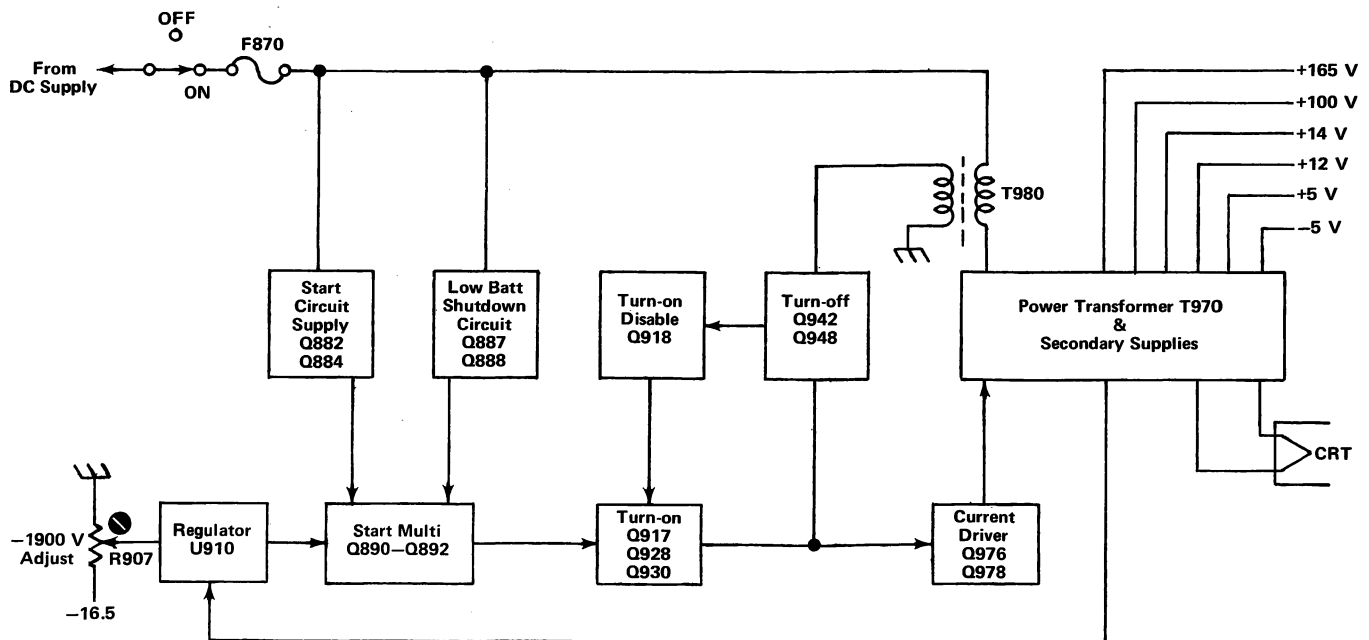


Fig. 3-6. Power Regulator (10) (11)

## Circuit Description—326 (SN 300500-up)

nating current in T970 and T980 primaries. At the same time a pulse is connected to the turn-on disable circuit which removes the turn-on signal to the current driver.

The next pulse from the start multi again starts the current buildup sequence.

Regulation is achieved by controlling the length of time that current is gated to T970 primary. The turn-on time is determined by the pulse repetition rate of the start multi, which is a function of the start multi collector supply voltage. The start multi collector supply levels are set by U910 (pin 6). The level at pin 6 is determined from two sources: a -16.5-volt DC supply (transformer secondary) to a variable divider, R907, and a sample of voltage from a section of the high voltage supply (transformer secondary).

Any attempted change of the output voltage (transformer secondary) causes the level at pin 6 (U910) to change, causing a change in start circuit multi switching rate, thus changing the transformer (T970) primary current duration, correcting the output voltage.

Once the supply output has come up to normal operating levels, the start circuit supply is reverse biased and T970 secondary supplies assume the regulator load.

In the event that the supply battery voltage drops to too low a level, the low battery shutdown circuit clamps one side of the start multi, turning off the current drive to T970 primary, thus shutting down the supply.

### Detailed Regulator Description (10) (11)

CR880 limits Zener current in VR882 over the wide range of acceptable supply voltages. VR882 sets the emitter levels of Q882 and Q884, providing start-up operating potential for the regulator. Once the regulator is functioning normally the start circuit supply is removed from the circuit (CR886 and Q884 reverse biased).

Q890, Q892, and associated circuitry, an astable multi provide a negative-going pulse through C892 to the base of Q917, turning Q917 on. Q917 turns on Q928. Q928 turn on produces a positive step at T930 secondary, turning on Q930, providing turn-on bias for the current drivers, Q976 and Q978. At the same time, the positive-going pulse at T930 secondary is fed back through R927 to Q928 base, reinforcing the turn on.

Current builds up in T970 primary, causing voltage buildup in T970 secondaries. Since T980 primary is in series with T970 primary, a voltage builds up across T980

secondary. This secondary voltage forward biases D940, increasing the voltage level at Q942 anode. When Q942 anode comes to within 0.6 volts of Q942 gate level, Q942 turns on, biasing Q948 into saturation, pulling Q976 and Q978 bases toward ground reverse biasing Q976 and Q978, rapidly terminating current in T970 primary.

At the time that Q942 conducts to saturate Q948, a pulse is fed back to Q918, turning Q918 on, cutting off Q928 and Q930, reinforcing the turnoff.

The rapid field collapse in T970 produces the flyback voltage in T970 secondary.

U910, an integrated circuit voltage regulator, controls the voltage applied to the start multi collectors. Two voltages influence the U910 output voltage (pin 6). Variable R907 (with R905 and R909 and the -16.5 volt supply) connected to U910 inverting input adjust the supply output secondary level (secondary voltages).

A sample of voltage picked off of one section of the high voltage supply is fed back to U910 non-inverting input.

Both of these U910 input voltages correct the output voltage level by controlling the voltage at pin 6 (U910). The voltage level at pin 6 determines the switching repetition rate of the start multi, thus setting the time duration of current buildup in T970 primary, thereby setting the output voltage level in T970 secondary.

Any attempted change in supply output level is seen at U910, correcting the level at pin 6, changing the repetition rate of the start multi, correcting the supply output voltages.

In normal operation (normal DC input supply levels) Q888 is forward biased, holding Q887 cut off, having no effect on the start multi. If the DC input supply level drops too low, Q888 turns off, permitting Q887 to turn on, pulling Q887 collector toward ground, thereby disabling the start multi, shutting down the supply.

Since the secondary supplies and regulation are conventional circuitry, no detailed description is given.

### Battery Charger (12)

With no instrument load on the battery, and FULL CHG-TRICKLE CHG switch in the FULL CHG position, the battery is charged at 150 mA as follows:

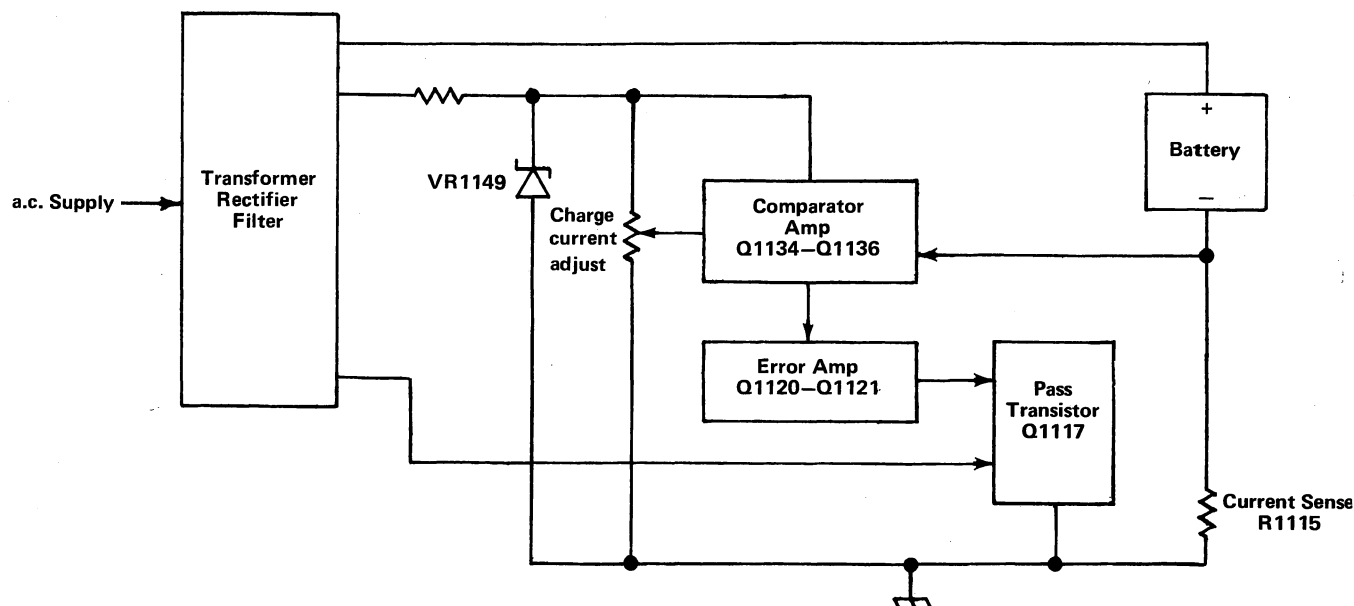


Fig. 3-7. Battery Charger

Charge current is supplied by the 5-6 terminals of T1101 secondary, the diode bridge, CR1110, through pass transistor, Q1117, and the sensing resistor, R1115.

The circuit which determines the charging current is a feedback amplifier consisting of a DC comparator (Q1134-Q1136), an error amplifier (Q1121-Q1120), and pass transistor (Q1117).

The base reference voltage of Q1136 is set by VR1149 and the divider, R1143 and variable R1144. Current for VR1149 is supplied by transformer secondary winding (7-8), rectifier CR1105, filter capacitor, C1105, and Zener current-setting resistor, R1105.

During full charge rate the voltage drop across sensing resistor, R1115 plus the drop across R1130 set the voltage level at Q1134. The base potential of Q1134 determines the current through R1139, setting the operating potential for Q1121. The current through the divider R1120-R1123 sets Q1120 base level. Q1120 conduction sets the base level for Q1117, the pass transistor, fixing the current to charge the battery at about 150 mA.

Any line voltage change is seen as a change in potential across the supply (transformer secondary terminals 5 and 6) and results in a change in potential across R1115 and is seen by Q1134 base as error signal.

The error signal is amplified in Q1121 and Q1120, which corrects the base drive to Q1117, bringing the feedback amplifier back to a state of balance.

If the instrument is turned on, the added load momentarily causes less charging current to flow to the battery. The reduced drop across R1115 is seen as error signal to the comparator Q1134-Q1136, causing a change in potential across R1139, which is amplified in Q1121-Q1120, increasing the drive to Q1117. The charge current increases to the point at which the feedback amplifier again reaches a balance (charge current back to 150 mA).

CR1137 and CR1138 prevent Q1134 and Q1136 collectors from rising to the point at which Q1134 and Q1136 would saturate during the periods when CR1110 (bridge) is not conducting.

The charge rate may be lowered to provide a trickle charge to the battery (to offset internal losses) by switching from FULL CHG to TRICKLE CHG. Switching R1133 into the circuit causes an additional drop across R1130, decreasing the voltage on Q1134 base. The reduced base voltage causes Q1117 drive (through Q1120-Q1121-R1139) to reduce the charge current to the battery.



# MAINTENANCE

## Introduction

This section of the manual contains maintenance information for use in preventive or corrective maintenance and troubleshooting the 326.

## GENERAL

### Cleaning

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Avoid chemicals which contain benzene, toluene, xylene, acetone or similar solvents.

### Semiconductor Checks

Periodic checks of the semiconductors in the 326 are not recommended. The best check of semiconductor performance is actual operation in the instrument.

### Recalibration

A calibration check is recommended after each 1000 hours of operation or every year if used infrequently. Replacement of components may necessitate recalibration of the affected circuits. Complete calibration instructions are given in the Performance Check/Adjust section.

### Troubleshooting Aids

**Diagrams.** Circuit diagrams are given on foldout pages in the Diagrams section. The circuit number and electrical value of each component are given on the diagrams. Important voltages are also shown.

**Circuit Boards.** A tint band outlines each circuit board on the Schematic Diagrams and a photograph of each board is shown to the left of the diagram. Each board-mounted electrical component is identified in the photograph by its circuit number.

**Voltages.** Often the defective components can be located by checking for the correct voltage in the circuit. Some typical voltages are given on the Schematic Diagrams. These voltages are not absolute, and may vary slightly from instrument to instrument.

**Power Supply Voltage.** Table 4-1 lists the voltage tolerances of the power supplies in the 326. If the power

supply voltage is within the listed tolerance, the supply can be assumed to be operating properly. If outside the tolerance, the supply may be misadjusted or operating incorrectly.

TABLE 4-1

Supply	Voltage	Ripple
-5 V	Within 2%	10 mV
+5 V	Within 2%	10 mV
+14 V	±20%	200 mV
+100 V	±5%	750 mV
+165 V	+8%, -6%	750 mV
+1900 V	Within 2%	

### Troubleshooting Equipment

The following equipment is useful for troubleshooting the 326.

**1. Semiconductor Tester.** While the most convenient check of the semiconductor device is substitution or junction resistance measurement, some means of testing transistors and diodes may be helpful. For complete tests, the TEKTRONIX 576 Semiconductor Curve Tracer is recommended.

**2. DC Voltmeter and Ohmmeter.** For most applications a 20,000 ohms/volt VOM can be used to check voltages and resistance, if allowance is made for the circuit loading when making voltage measurements at high impedance points.

**3. Test Oscilloscope.** A test oscilloscope is required to check circuit waveforms. An oscilloscope having a DC to 10 MHz frequency response and 1 mV/Div to 10 V/Div vertical deflection factor is suggested. A 10X probe should be used where circuit loading is critical.

## REPLACEMENT PARTS

### Standard Parts

#### NOTE

*All replacement parts should be direct replacements unless it is known that a different component will not adversely affect the instrument performance.*



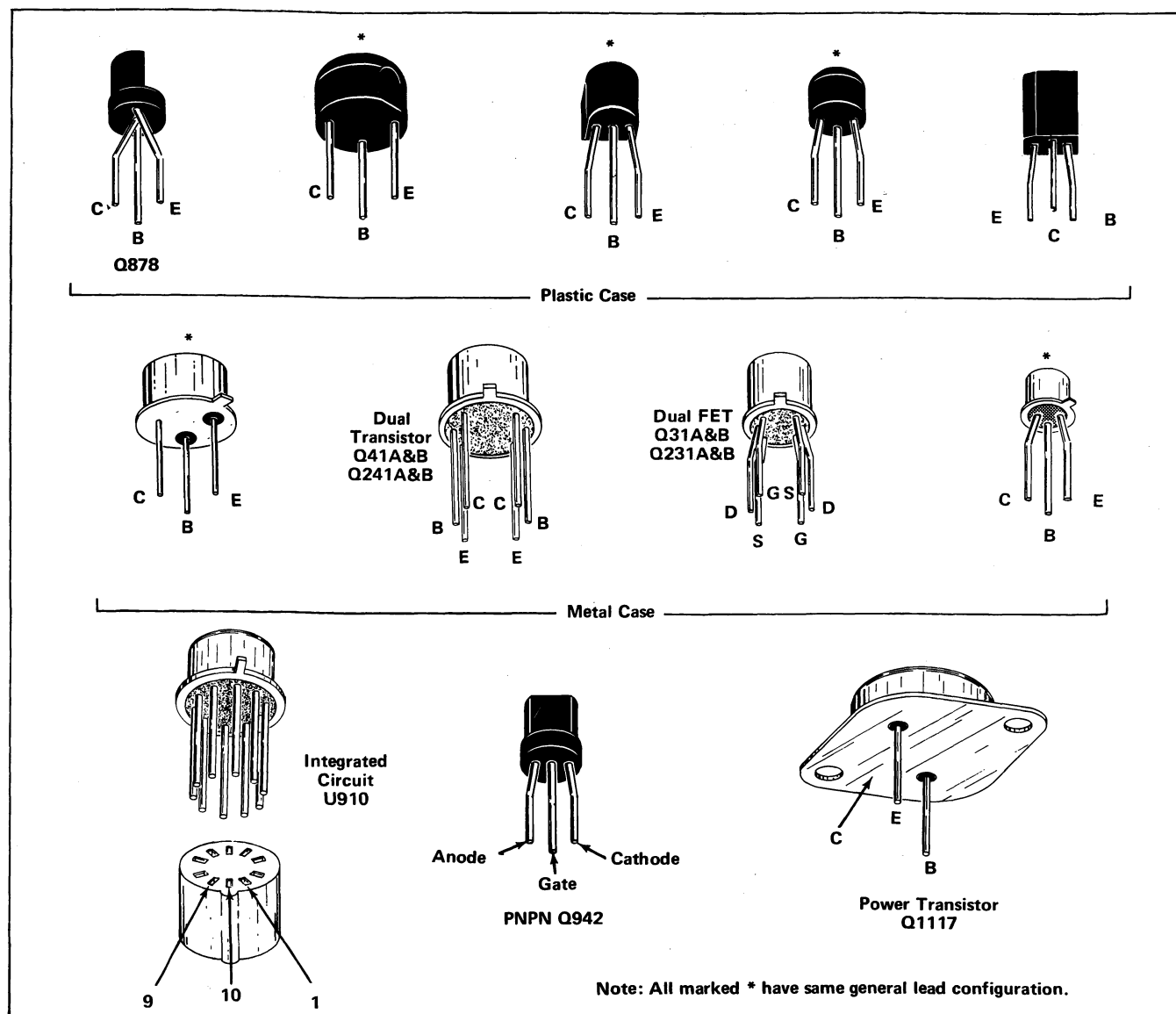


Fig. 4-1. Transistor lead configurations.

Refer to the Parts Ordering Information preceding the Electrical Parts List and Mechanical Parts List sections.

### Special Parts

Some parts are manufactured or selected by SONY/TEKTRONIX to satisfy particular requirements, or are manufactured for SONY/TEKTRONIX to our specifications. These special parts are indicated in the parts lists by an asterisk preceding the part number. Most of the mechanical parts used in this instrument have been manufactured by SONY/TEKTRONIX. Order all special parts directly from your local TEKTRONIX Field Office or Representative.

## ASSEMBLY AND COMPONENT REPLACEMENT

### General

The exploded-view drawings associated with the Mechanical Parts List pullout page (Fig. 1, EXPLODED) may be helpful when disassembling or reassembling individual components or sub-assemblies.

### Semiconductor Replacement

Replacement semiconductors should be of the original type or a direct replacement. Fig. 4-1 shows the lead

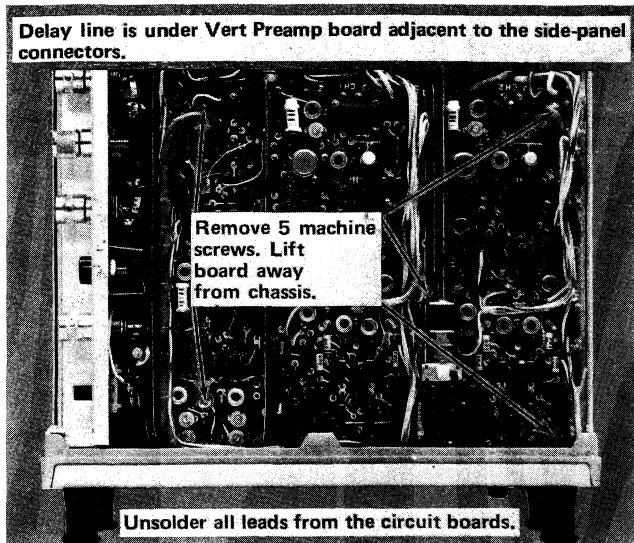


Fig. 4-2. Vertical Preamp circuit board removal.

configuration of the semiconductors used in this instrument. Some plastic cased transistors may have lead configurations which do not agree with those shown here. If a replacement transistor is made by a manufacturer other than the original, check the manufacturer's basing diagram for correct basing. All transistor sockets in this instrument are wired for the standard basing as used for metal-cased transistors.

### Circuit Board Removal

Color codes for all wire connections to the boards can be found adjacent to the corresponding schematic (foldout at rear).

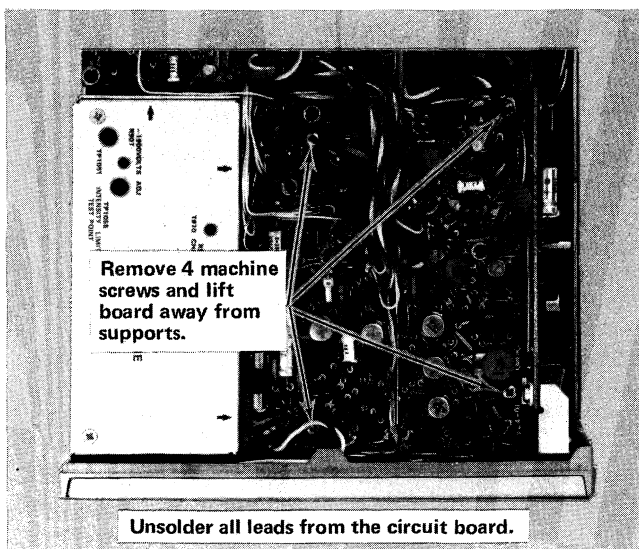


Fig. 4-3. Horizontal circuit board removal.

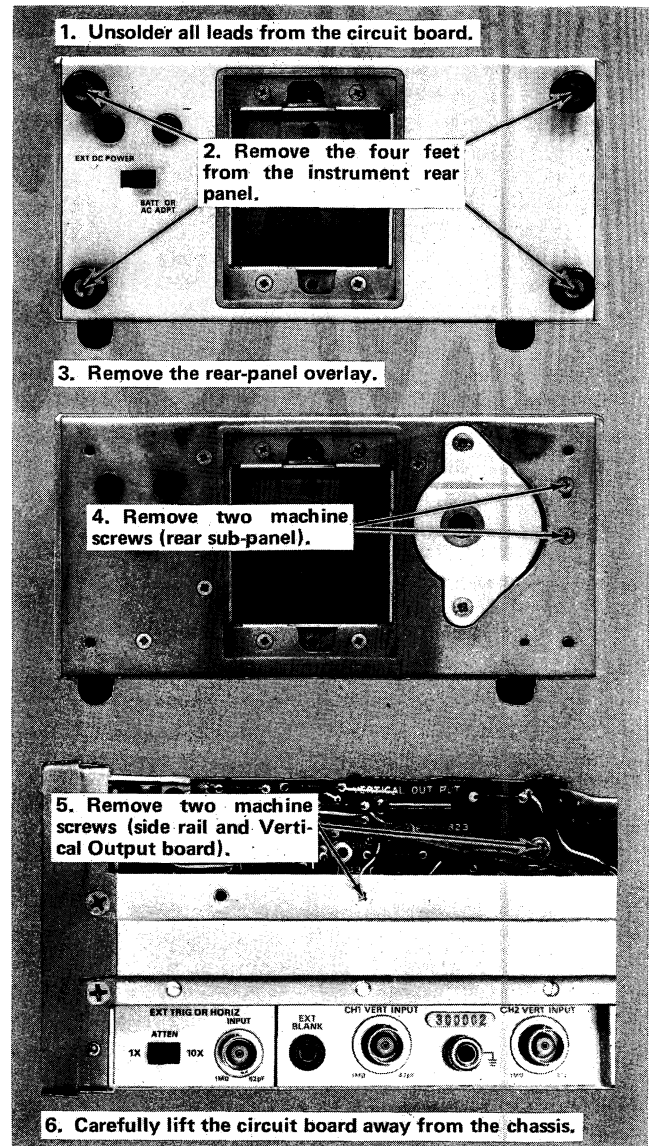


Fig. 4-4. Vertical Output circuit board removal.

Follow the instructions for the given circuit board in the following figures, 4-2 through 4-7.

### Power Supply-Regulator Removal

#### CAUTION

*Remove the battery pack before removing the Power Supply-Regulator board.*

Remove the machine screws indicated by the arrows in Fig. 4-8A.

Very carefully pull the supply assembly straight up until the assembly is free of the chassis.

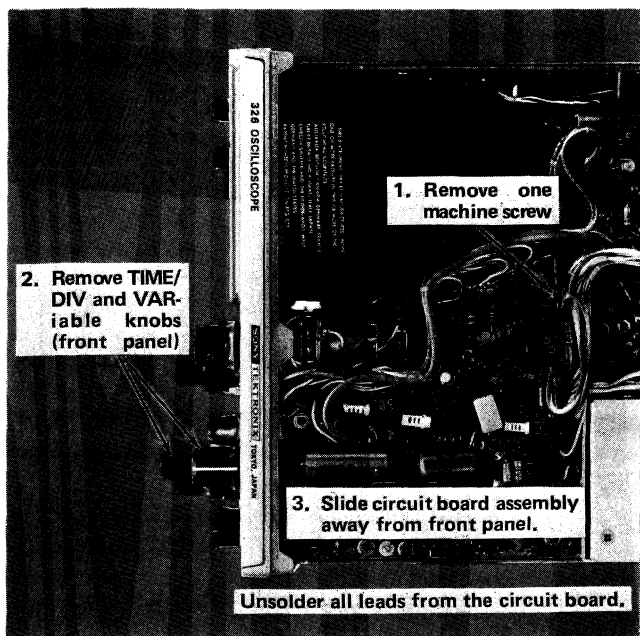


Fig. 4-5. Trigger Sweep circuit board removal.

## Power Supply-Regulator Cover Removal

Remove the three machine screws on top of cover and two machine screws at the back end of cover as shown in Fig. 4-8B and remove the cover.

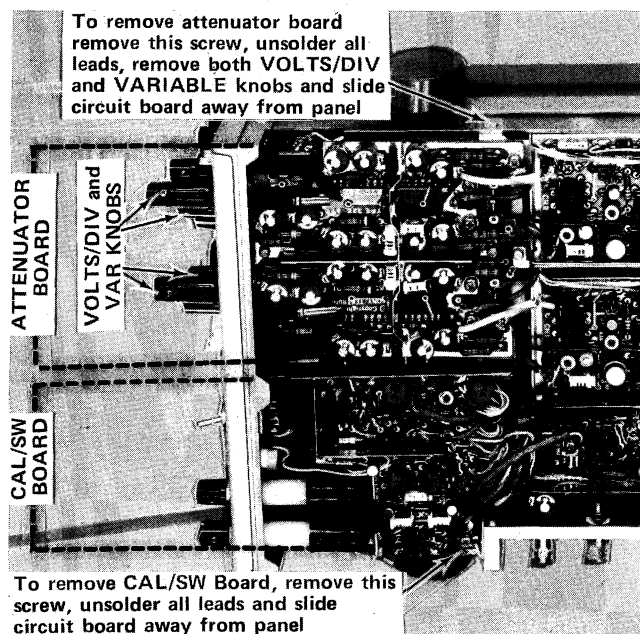


Fig. 4-6. Calibrator/Switching circuit board and attenuator circuit board removal.

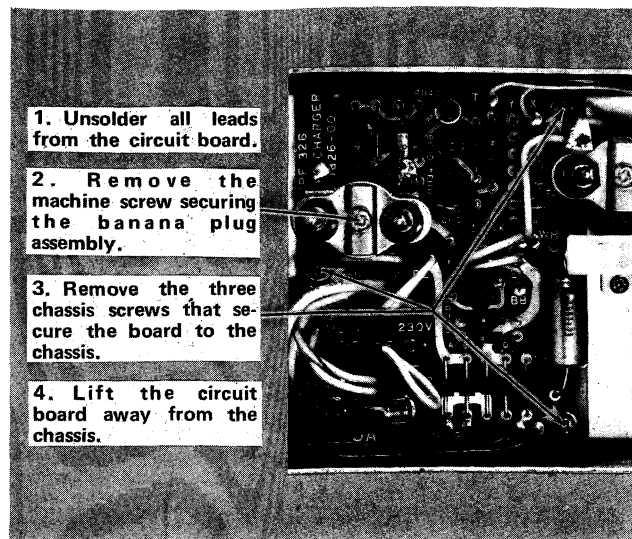


Fig. 4-7. Battery Charger circuit board removal.

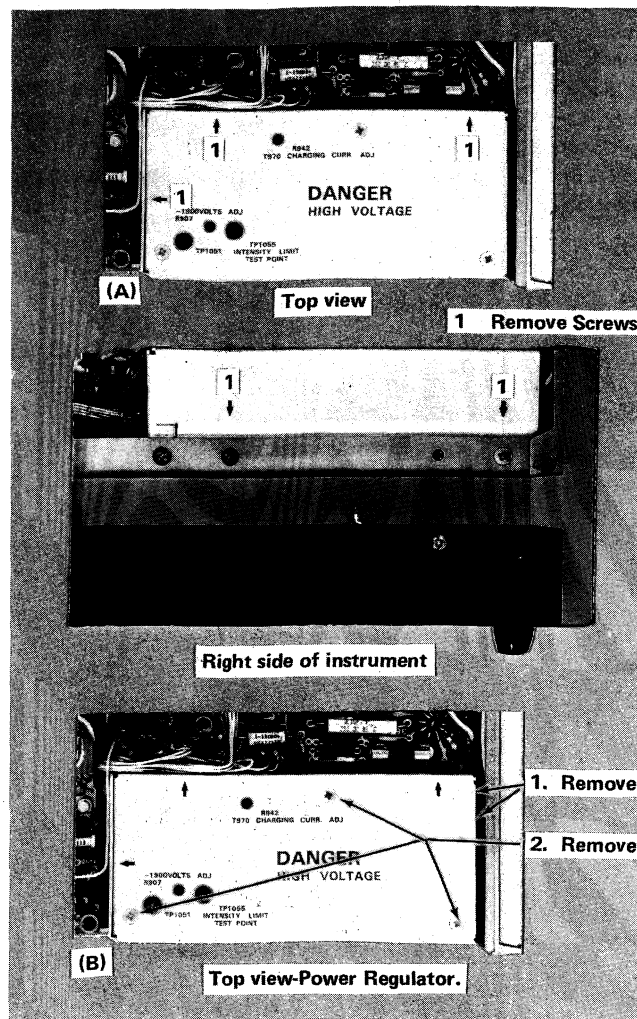


Fig. 4-8. Removing (A) Power Regulator and (B) Regulator cover.

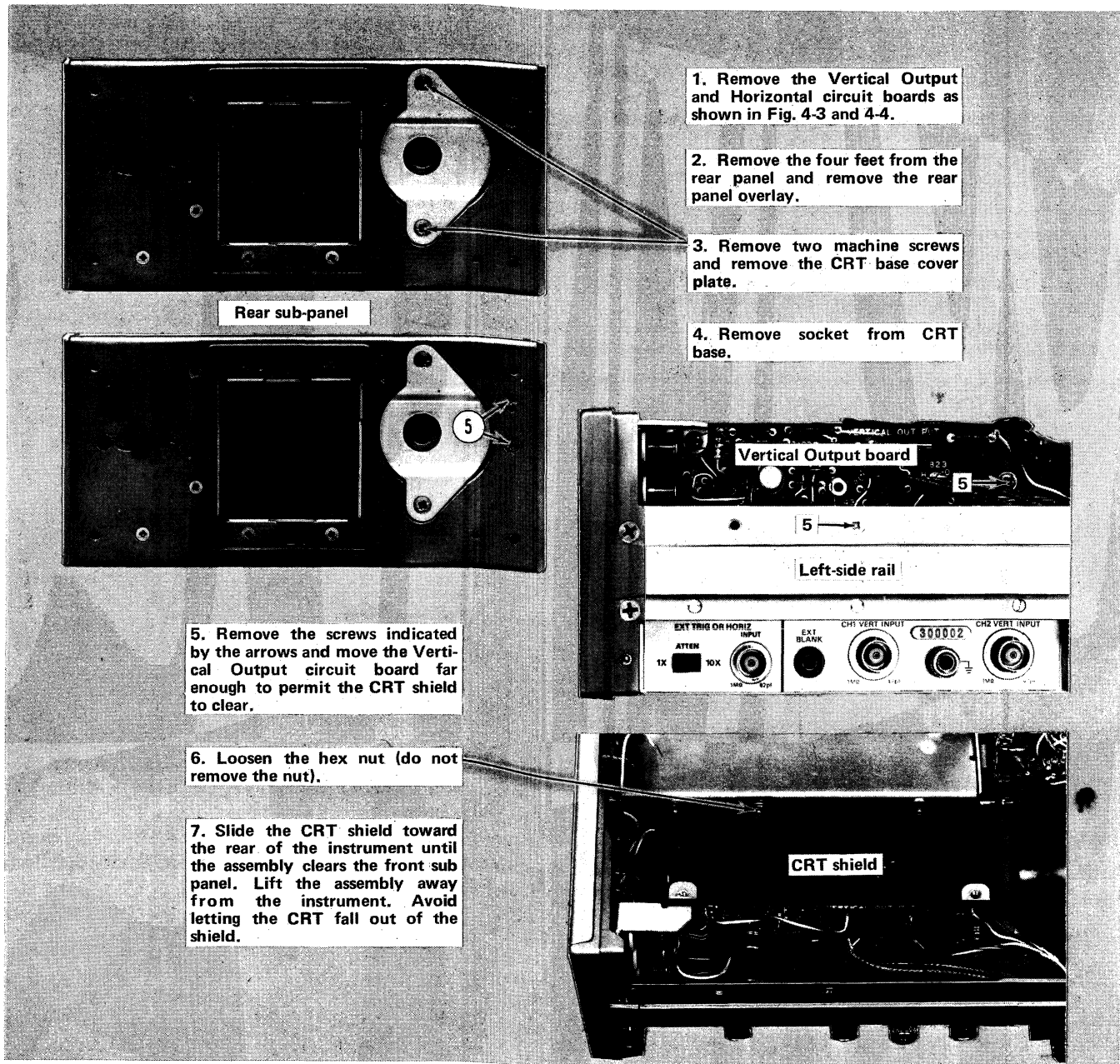


Fig. 4-9. CRT removal.

## CRT Removal

Remove the CRT as shown in Fig. 4-9.

## Cam Switch Replacement

Each new cam switch is shipped with a metal cover. This cover should be discarded after switch installation. Replace the switch as follows:

1. Remove the double cover from the pair of cam switches.

2. Remove the defective cam switch.

3. Leave the metal cover on the new cam switch and secure the switch to the circuit board in the same position as the switch just removed.

4. Check the new switch for proper mechanical operation (freedom of rotation, etc.).

5. Remove the metal cover from the switch just installed and replace the double cover over both switches.



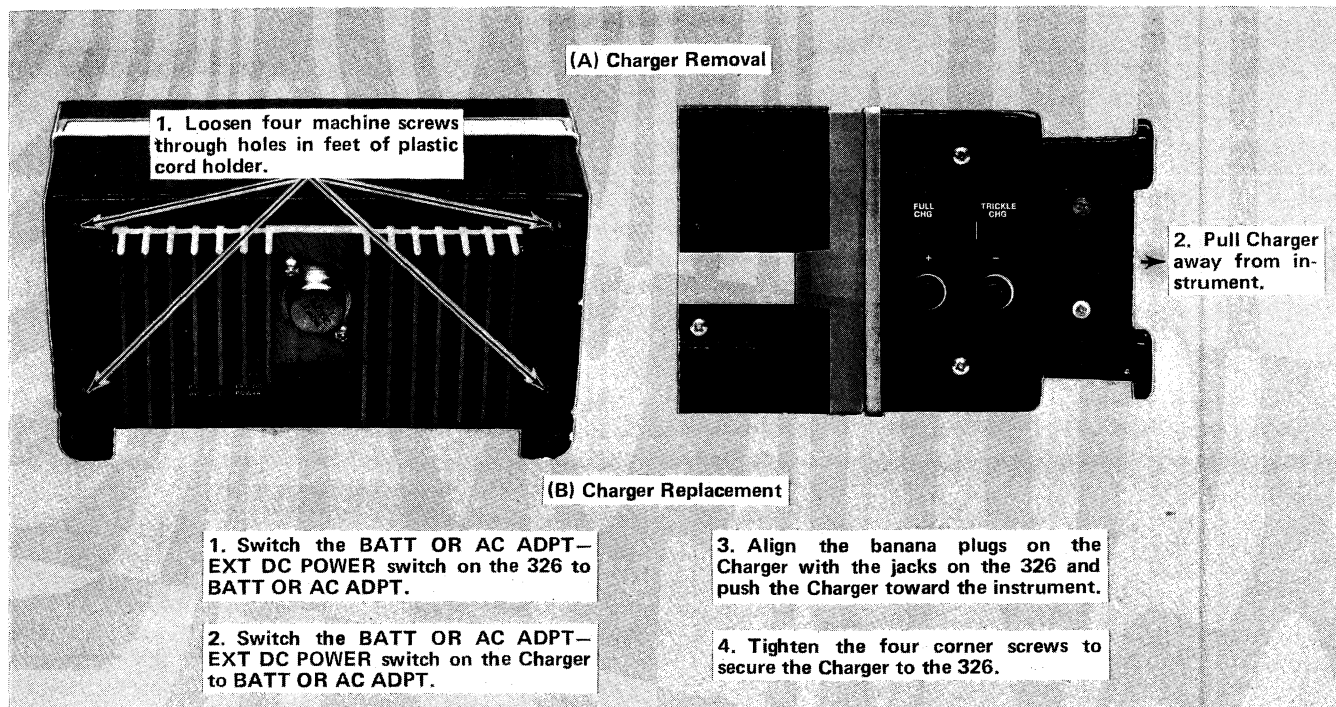


Fig. 4-10. Battery Charger (A) removal and (B) replacement.

### Battery Charger Removal and Replacement

See Fig. 4-10 for Battery Charger removal and replacement instructions.

### Instrument Repackaging

If the 326 is to be shipped over long distances by commercial transportation, it is recommended that the

instrument be repackaged in the original manner for maximum protection. Repackaging information and/or new shipping carton may be obtained from Tektronix, Inc. Contact the nearest TEKTRONIX Field Office or Representative. See Fig. 2 Repackaging (pullout, Mechanical Parts List, Section 8).

# PERFORMANCE CHECK/ADJUSTMENT

## Introduction

A performance check is recommended every 1000 hours of operation, or every year if used infrequently. Before complete calibration, the instrument should be cleaned and inspected as outlined in the Maintenance section.

The Performance Check can be used to check instrument performance without making any internal adjustments.

As an aid to checking the performance of the 326, a Short-Form Procedure is given preceding the complete procedure. To facilitate instrument checkout, the Short-Form Procedure lists the check and applicable tolerances. This procedure also includes the step, number, and title as listed in the complete Performance Check, and the page number on which each step begins. The Short-Form Procedure also provides spaces to record performance data or to check off steps as they are completed.

Following the Performance Check is a complete ADJUSTMENT procedure. Completion of the Adjustment Procedure insures that the instrument meets the electrical specifications given in Section 1.

## NOTE

*Limits, tolerances, and waveforms in the ADJUSTMENT procedure are given as calibration guides and should not be interpreted as instrument specifications except as specified in Section 1.*

## TEST EQUIPMENT REQUIRED

### General

The following test equipment and accessories, or equivalent, are required for complete check or adjustment of the 326. Specifications given are the minimum necessary for accurate check or adjustment. Some of the recommended equipment may have specifications that exceed those given. All test equipment is assumed to be correctly calibrated and operating within the given specifications. If equipment is substituted, it must meet or exceed the specifications of the recommended equipment.

Special TEKTRONIX calibration fixtures are used to facilitate calibration and performance checks. These special fixtures are available from Tektronix, Inc. Order by part number through your local TEKTRONIX Field Office or representative.

### Test Equipment

1. Precision DC voltmeter. Accuracy, within  $\pm 0.1\%$ ; range, zero to 200 volts. For example, Fluke Model 825A Differential DC Voltmeter.

2. DC voltmeter (VOM). Minimum sensitivity, 20,000 ohms/volt; accuracy, checked to within 1% at  $-1900$  volts. For example, Triplet Model 630-NA.

3. Variable DC power supply. Voltage range, at least  $+7$  to  $+32$  volts; current capability, at least 1.5 ampere; output voltage, measured within 3%.

4. Test oscilloscope. Bandwidth, DC to 10 MHz; minimum deflection factor, 2 mV/Div; accuracy, within 3%. SONY/TEKTRONIX Type 324 Oscilloscope is recommended.

5. Time-mark Generator. Marker output,  $0.1 \mu\text{s}$  to  $0.1 \text{ s}$ ; marker accuracy, within 0.1%. TEKTRONIX 2901 Time-Mark Generator is recommended.

6. Standard Amplitude Calibrator. Amplitude accuracy, within 0.25%; signal amplitude, 5 mV to 100 volts; output signal, square wave. TEKTRONIX Calibration Fixture 067-0502-01 is recommended.

7. Square-Wave Generator. Must have the following output capabilities (may be obtained from separate generators): 120 volts amplitude at 1 kHz repetition rate with a one microsecond risetime; 500 mV into 50 ohms at 1.0 kHz and 1.0 MHz repetition rates with a 50 ns risetime. TEKTRONIX Type 106 Square-Wave Generator is recommended (meets both output requirements).

8. High-Frequency Constant-Amplitude Sine-Wave Generator. Frequency, 350 kHz to above 10 MHz; reference frequency, 50 kHz; output amplitude, variable from 5 mV to 0.5 volt into 50 ohms; amplitude accuracy, constant



## Performance Check/Adjustment—326 (SN 300500-up)

within 3% at 50 kHz and from 350 kHz to above 10 MHz. TEKTRONIX Type 191 Constant Amplitude Signal Generator is recommended.

9. Low-Frequency Constant-Amplitude Sine-Wave Generator. Frequency, 2 Hz to 100 kHz; output amplitude, variable from 50 mV to 16 volts, peak to peak; amplitude accuracy, constant within 3% from 2.0 Hz to 100 kHz. For example, General Radio 1310-A Oscillator (use a General Radio Type 274QBJ adapter to provide BNC output).

10. Variable Autotransformer<sup>1</sup>. Must be capable of supplying a range of 90 to 136 volts (180 to 272 volts for 230-volts nominal line). If autotransformer does not have an AC voltmeter, monitor the output with an AC voltmeter having a range of 136 or 272 volts, RMS. For example, General Radio W10MT3A Metered Variac Autotransformer for 115 volts or General Radio W20MT3A for 230-volt nominal operation.

11. 1X Probe with BNC connector. TEKTRONIX P6011 is recommended.

12. Cable. Impedance, 50 ohms; type, RG-58/U; length, 42 inches; connectors, BNC. TEKTRONIX Part Number 012-0057-01.

13. Calibration Shield. SONY/TEKTRONIX Calibration Fixture. TEKTRONIX Part Number 067-0669-01.

14. Adapter. Adapts GR874 to BNC male connector. TEKTRONIX Part Number 017-0063-00.

15. Termination. Impedance, 50  $\Omega$ ; accuracy,  $\pm 2\%$ ; connectors, BNC. TEKTRONIX Part Number 011-0049-01.

16. 10X Attenuator. Impedance, 50  $\Omega$ ; accuracy,  $\pm 2\%$ ; connectors, BNC. TEKTRONIX Part Number 011-0059-01.

17. Input RC Normalizer. Time constant, 1 M $\Omega$  and 47 pF; attenuation, 2X; connectors, BNC. TEKTRONIX Calibration Fixture 067-0541-00.

18. 10X probe for the 326 and the 324 Test Oscilloscope. TEKTRONIX P6049A Probe is recommended (two supplied as accessories).

19. Current Probe for the 324 Test Oscilloscope. TEKTRONIX P6021 is recommended. TEKTRONIX Part Number is 015-0140-02.

20. Adapter, BNC to Binding Post. TEKTRONIX Part Number 103-0033-00.

21. BNC T Connector. TEKTRONIX Part Number 103-0030-00.

22. Patch Cord. Length, 18 inches; connectors, banana plug-jack and BNC male. TEKTRONIX Part Number 012-0090-00.

23. Patch Cord. Length, 18 inches; connectors, banana plug-jack to banana plug-jack. TEKTRONIX Part Number 012-0039-00.

24. Cable. Impedance, 50  $\Omega$  type RG-58/U; length, 18 inches; connectors, BNC. TEKTRONIX Part Number 012-0076-00.

25. Dual Input Coupler. Matched signal transfer to each input. TEKTRONIX Calibration Fixture 067-0525-00.

## Adjustment Tool

26. Low-capacitance screwdriver. 1 1/2-inch shaft. TEKTRONIX Part Number 003-0000-00.

## SHORT-FORM PERFORMANCE CHECK AND INDEX

326 Serial Number \_\_\_\_\_

Date \_\_\_\_\_

By \_\_\_\_\_

1. Check Astigmatism Page 5-4

Sharp, well-defined trace.

2. Check Trace Alignment Page 5-4

Marker baseline should be parallel to the horizontal graticule lines.

3. Check Geometry Page 5-4

Deviation from a straight line, not more than 0.1 division.

<sup>1</sup>Not required for performance check only.

- |   |          |  |           |
|---|----------|--|-----------|
| 4. Check Compression  | Page 5-5 | 15. Check Common-Mode Rejection  | Page 5-7  |
| Compression not to exceed 0.15 division.  |          | Rejection Ratio, 20:1.   |           |
| 5. Check CH 1 X1 Vertical Gain  | Page 5-5 | 16. Check Magnified Registration   | Page 5-8  |
| Vertical deflection, 5 divisions, $\pm 0.15$ division.  |          | Middle marker within 1.0 division of the center vertical graticule line. |           |
| 6. Check CH 1 X10 Vertical Gain   | Page 5-5 | 17. Check Normal Timing  | Page 5-8  |
| Vertical deflection, 5 divisions, $\pm 0.15$ division.  |          | Check Timing as shown in Table 5-2.                                      |           |
| 7. Check CH 1 Vertical Deflection Accuracy  | Page 5-5 | 18. Check Variable Time/Div Range  | Page 5-9  |
| Indicated deflection, $\pm 3\%$ .   |          | Range, at least 2.5:1.   |           |
| 8. Check CH 1 Variable Volts/Div Range  | Page 5-5 | 19. Check Magnified Timing   | Page 5-9  |
| Range at least 2.5:1.   |          | Check timing as shown in Table 5-3.                                      |           |
| 9. Check High Frequency Compensation  | Page 5-6 | 20. Check External Horizontal  | Page 5-9  |
| Check for best square corner (leading edge). Aberrations not to exceed +2.5% or -2.5% with peak-to-peak not to exceed 4%. |          | Horizontal deflection, 4 div to 6.7 div.                                 |           |
|   |          | Variable range, 10:1 or greater.   |           |
| 10. Check CH 1 Input Capacitance  | Page 5-6 | 21. Check External Horizontal Bandwidth (Upper -3 dB Point)              | Page 5-10 |
| 0.2 div, or less, overshoot or rounding (47 pF, $\pm 4$ pF).  |          | At least 200 kHz.  |           |
| 11. Check CH 1 Volts/Div Switch Compensation  | Page 5-6 | 22. Check External Blanking  | Page 5-10 |
| Optimum square corner and flat top at each Volts/Div switch setting.  |          | Check for blanking of a portion of each cycle.                           |           |
| 12. Check CH 1 Vertical Upper -3 dB Point (X1 Gain)   | Page 5-6 | 23. Check High Frequency Triggering                                      | Page 5-10 |
| At least 10 MHz.  |          | Stable Triggering on:  |           |
|   |          | 0.3 div display at 1.0 MHz, INT LF REJ,                                  |           |
| 13. Check CH 1 Vertical Upper -3 dB Point (X10 Gain)  | Page 5-7 | 1.0 div display at 10.0 MHz, INT LF REJ,                                 |           |
| At least 5 MHz.   |          | 1.5 div display at 1.0 MHz, EXT AC and DC.                               |           |
| 14. Check CH 1 Vertical AC-Coupled Lower -3 dB Point  | Page 5-7 | 24. Check Low-Frequency Triggering                                       | Page 5-11 |
| 10 Hz or less.  |          | Stable Triggering on:  |           |
| Repeat steps 4 through 14 for CH 2.   |          | 1.5 div display at 30 Hz in EXT AC and DC,                               |           |
|   |          | 0.3 div display at 30 Hz in INT AC.                                      |           |

## Performance Check/Adjustment—326 (SN 300500-up)

### 25. Check Low-Frequency Reject Page 5-11

Stable display cannot be obtained at 30 Hz.

### 26. Check Calibrator Page 5-11

Duty Cycle, 40% to 60%.

Output amplitude, 5 divisions.

## PERFORMANCE CHECK PROCEDURE

### General

The following procedure uses the equipment listed under Test Equipment Required. If other equipment is substituted, control settings or checking setup may need to be altered to meet the requirements of the equipment used. Operating instructions for the test equipment are not given in this procedure. Refer to the test equipment instruction manual if more information is required.

The control settings throughout the procedure continue from the preceding step unless otherwise noted.

### NOTE

*Control titles that are printed on the front panel of the 326 are capitalized in this procedure (e.g., CH 1 VOLTS/DIV). Associated equipment controls are initial capitalized only (e.g., Output Amplitude).*

## PERFORMANCE CHECK

### Initial Control Settings for Performance Check

CH 1 and CH 2	
VOLTS/DIV	.5 V
Input Coupling AC-DC	DC
Mode	CH 1
TRIGGERING	
CH 1—NORM	CH 1
Coupling	INT AC
TIME/DIV	1 ms
Horiz POSITION	Midrange

### 1. Check Astigmatism

a. Connect the Time-Mark Generator output to the CH 1 VERT INPUT with a BNC cable. Set the Time-Mark Generator for 1 ms markers.

b. Set the INTENSITY control midway between a barely visible trace and fully clockwise.

c. Set the trigger controls for a stable display.

d. CHECK—Markers should be well defined within the areas indicated in Fig. 5-1 with optimum setting of the FOCUS control.

### 2. Check Trace Alignment

a. Vertically position the marker baseline to the center horizontal graticule line.

b. CHECK—Marker baseline should be parallel to the center horizontal graticule line.

### 3. Check Geometry

a. Set VOLTS/DIV switch to .1.

b. Vertically position the marker baseline below the bottom graticule line.

c. CHECK—CRT display for minimum curvature of the vertical markers. Maximum deviation from a straight line, 0.1 division.

d. Disconnect the Time-Mark Generator.

e. Set LEVEL/SLOPE to +AUTO.

f. Vertically position the trace to the top graticule line.

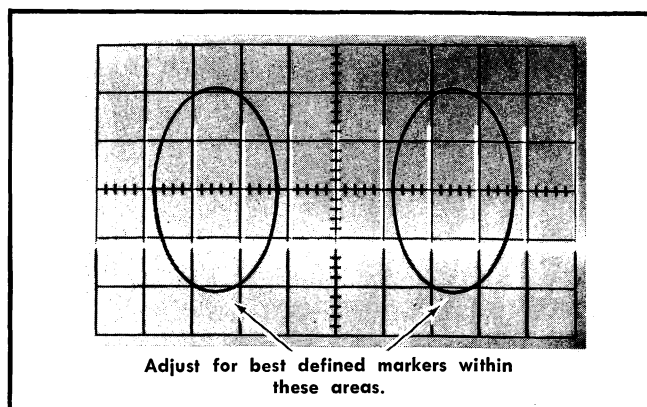


Fig. 5-1. Astigmatism check, typical display.

g. CHECK—Deviation from a straight line should not exceed 0.1 division.

h. Vertically position the trace to the bottom graticule line.

i. CHECK—Deviation from a straight line should not exceed 0.1 division.

#### 4. Check Compression

- Set CH 1 VOLTS/DIV to 5 DIV CAL.
- Vertically position the bottom of the display to the first graticule line below the horizontal center line.
- Reduce the display to exactly two divisions with the Variable VOLTS/DIV control.
- Vertically position the top of the display to the top graticule line.
- CHECK—Compression (reduction in amplitude) not to exceed 0.15 division.
- Vertically position the bottom of the display to the bottom graticule line.
- CHECK—Compression, not to exceed 0.15 division.

#### 5. Check CH 1 X1 Vertical Gain

Reset the following controls:

VOLTS/DIV                      0.1  
Variable VOLTS/DIV        CAL

- Connect the Standard Amplitude Calibrator output connector to CH 1 VERT INPUT connector via a 50-ohm BNC cable.
- Set the Standard Amplitude Calibrator for a 50 mV square-wave output.
- Vertically center the display.
- CHECK—Vertical deflection equal to 5 divisions,  $\pm 0.15$  division.

#### 6. Check CH 1 X10 Vertical Gain

- Set the Standard Amplitude Calibrator for a 5 mV square-wave output.
- Pull the POSITION X10 VERT GAIN control.
- Vertically center the display.
- CHECK—Vertical deflection equal to 5 divisions,  $\pm 0.15$  division.

#### 7. Check CH 1 Vertical Deflection Accuracy

- Push the POSITION X10 VERT GAIN control knob.
- CHECK—Using the VOLTS/DIV switch and Standard Amplitude Calibrator settings given in Table 5-1, check deflection accuracy at each position of the VOLTS/DIV switch.

TABLE 5-1

VOLTS/DIV Switch Settings	Calibrator Amplitude	Vertical Deflection in divisions	Max Error in divisions
.01	50 mV	5	$\pm 0.15$
.02	0.1 V	5	$\pm 0.15$
.05	0.2 V	4	$\pm 0.12$
.1	0.5 V	5	$\pm 0.15$
.2	1 V	5	$\pm 0.15$
.5	2 V	4	$\pm 0.12$
1	5 V	5	$\pm 0.15$
2	10 V	5	$\pm 0.15$
5	20 V	4	$\pm 0.12$
10	50 V	5	$\pm 0.15$

#### 8. Check CH 1 Variable Volts/Div Range

- Set the Standard Amplitude Calibrator for a 50 mV square-wave output.
- Reset CH 1 VOLTS/DIV to .01.
- Vertically center the display.

## Performance Check/Adjustment—326 (SN 300500-up)

d. CHECK—Rotate the CH 1 Variable VOLTS/DIV control fully counterclockwise. Display must reduce to two divisions or less.

e. Return the VOLTS/DIV Variable to the CAL position.

### 9. Check High Frequency Compensation

Reset the controls as follows:

X10 VERT GAIN	Pushed in
X10 HORIZ MAG	Pulled
TIME/DIV	1 $\mu$ s

a. Connect the Square-Wave Generator Fast-Rise + Output connector to CH 1 VERT INPUT connector through a GR to BNC adapter, 50-ohm BNC cable, 10X, 50-ohm attenuator, and a 50-ohm BNC termination in the order given.

b. Set the Square-Wave Generator for a four division display at 100 kHz.

c. Horizontally position the leading edge of the square wave into the viewing area. Reset triggering as necessary for correct display. See Fig. 5-2.

d. CHECK—The display for best square corner (aberrations not to exceed +2.5% or -2.5% with peak-to-peak aberrations not to exceed 4%.

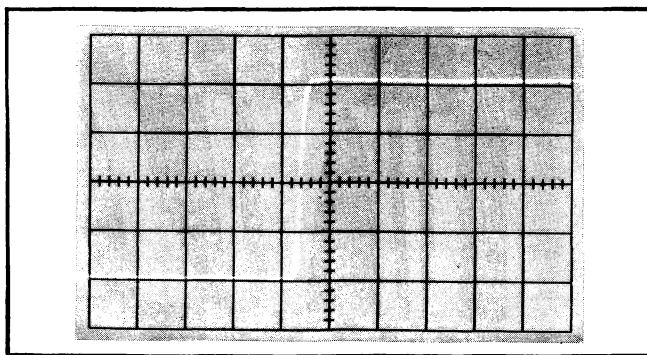


Fig. 5-2. High frequency response check, typical display.

### 10. Check CH 1 Input Capacitance

Reset the controls as follows:

TIME/DIV	.5 ms
CH 1 X10 VERT GAIN	Pushed

a. Connect the Square-Wave Generator High Amplitude Output connector to the CH 1 VERT INPUT connector through the GR to BNC adapter, 50-ohm BNC cable, 50-ohm termination, and 47 pF RC Normalizer in the order given.

b. Set the Square-Wave Generator for a five-division display at one kHz.

c. CHECK—CRT display for 0.2 division, or less, of overshoot or rounding (47 pF,  $\pm 4$  pF; see Fig. 5-3).

### 11. Check CH 1 Volts/Div Switch Compensation

a. Connect a P6049A Probe to the CH 1 VERT INPUT connector.

b. From the Square-Wave Generator High Amplitude Output connect a GR to BNC adapter, 10X 50-ohm BNC attenuator and BNC binding post adapter.

c. Connect the P6049A Probe tip to the BNC-binding post adapter.

d. Set the Square-Wave Generator for a five-division display at 1 kHz.

e. Compensate the probe as described in the probe manual.

f. CHECK—CRT display for optimum square corner and flat top at each VOLTS/DIV switch setting. Adjust the generator output for each switch position to maintain a five-division display.

### 12. Check CH 1 Vertical -3 dB Point (X1 Gain)

Reset the controls as follows:

CH 1 VOLTS/DIV	.01
X10 VERT GAIN	Pushed in
TIME/DIV	1 ms

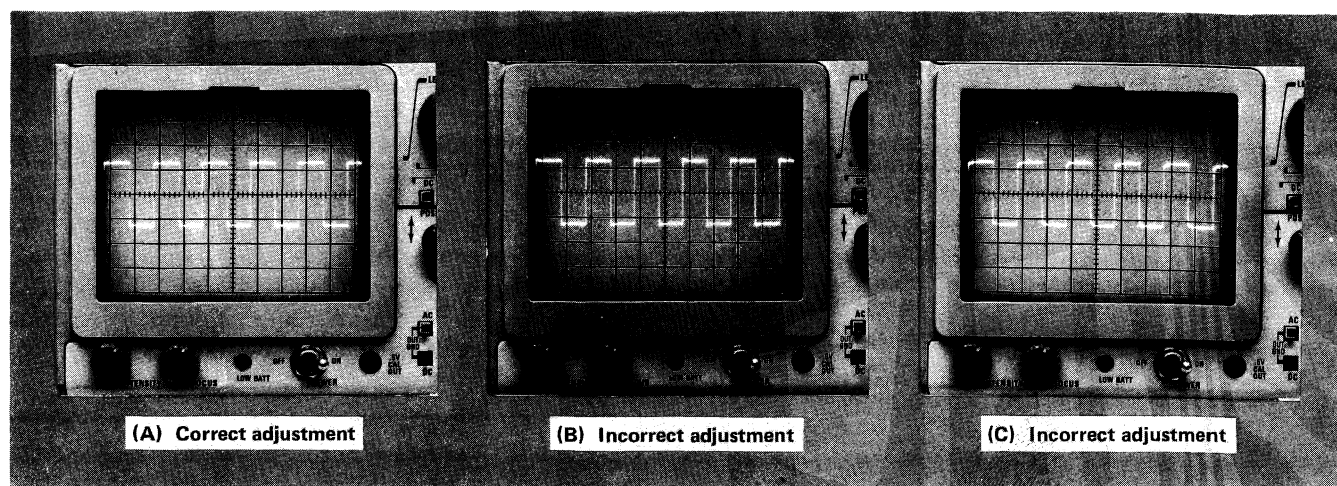


Fig. 5-3. Input capacitance check, typical displays.

a. Connect a High-Frequency Constant-Amplitude Sine-Wave Generator to the CH 1 VERT INPUT connector through the GR to BNC adapter, 50-ohm BNC cable, 10X 50-ohm BNC attenuator and a 50-ohm BNC termination.

b. Set the Constant-Amplitude Sine-Wave Generator for a four-division display, centered on the graticule, at the generator reference frequency (50 kHz).

c. Without changing the generator output amplitude, increase the frequency until the display amplitude is reduced to 2.8 divisions (–3 dB point).

d. CHECK—Generator output frequency must be at least 10 MHz.

### 13. Check CH 1 X10 Vertical Gain Upper –3 dB Point

a. Pull the X10 VERT GAIN switch.

b. Set the Constant-Amplitude Sine-Wave Generator for a four-division display, centered on the graticule, at the generator reference frequency (50 kHz).

c. Without changing the generator amplitude, increase the frequency until the display amplitude is reduced to 2.8 divisions (–3 dB point).

d. CHECK—Generator output frequency must be 5 MHz or greater.

### 14. Check CH 1 Vertical AC-Coupled Lower –3 dB Point

Reset the controls as follows:

CH 1 AC-DC	AC
X10 VERT GAIN	Pushed in
TIME/DIV	2 ms

a. Connect the Low-Frequency Constant-Amplitude Sine-Wave Generator to the CH 1 VERT INPUT connector through the 50-ohm BNC cable and a 50-ohm termination.

b. Set the generator for a four-division display, centered on the graticule, at a 1.0 kHz reference frequency.

c. Without changing the generator amplitude, decrease the frequency until the display amplitude decreases to 2.8 divisions.

d. CHECK—Generator frequency must be 10 Hz or less.

e. Remove the low-frequency generator, set the Mode switch to CH 2, and check CH 2, starting with step 4. After completing steps 4 through 14, for CH 2, continue with step 15.

### 15. Check Common-Mode Rejection

Change the following control settings:

TRIGGERING	
CH 1—NORM	CH 1
LEVEL/SLOPE	+AUTO
Coupling	INT AC



## Performance Check/Adjustment—326 (SN 300500-up)

TIME/DIV                      1  $\mu$ s  
Mode                            CH 1  
CH 1 VOLTS/DIV            0.01

a. Connect the Low-Frequency Constant-Amplitude Sine-Wave Generator output through a 50-ohm BNC cable, 50-ohm BNC termination, and a 50-ohm dual-input coupler to CH 1 and CH 2 VERT INPUT connectors.

b. Adjust the generator output amplitude for an eight-division display (80 mV) at 2 MHz.

c. Set Mode switch to ADD.

d. Set the CH 2 INVERT button to the OUT position.

e. CHECK—Display for not more than 0.4 division of display (20:1 rejection ratio).

## 16. Check Magnified Registration

Reset controls as follows:

CH 1 VOLTS/DIV            .1  
Input AC-DC                DC  
TIME/DIV                    1 ms

a. Connect the Time-Mark Generator to the CH 1 VERT INPUT through the 50-ohm BNC cable and 50-ohm termination.

b. Set the Time-Mark Generator for 5 ms markers.

c. Set the trigger controls for a stable display in the variable positive-slope area.

d. Position the middle marker (of the three markers displayed) to the center vertical line.

e. Pull the X10 HORIZ MAG switch. Do not change knob rotational position.

f. CHECK—Middle marker should remain within one division of the center vertical graticule line.

## 17. Check Normal Timing

a. Push the X10 HORIZ MAG knob.

b. Set the Time-Mark Generator for 1-ms markers and the 326 TIME/DIV to 1 ms.

c. Set the trigger control for a stable display in the variable positive slope area.

d. CHECK—CRT display for one marker per division. With the second marker positioned exactly to the second vertical line, the tenth marker must be within 3% (0.24 div) of the tenth vertical line (see Fig. 5-4).

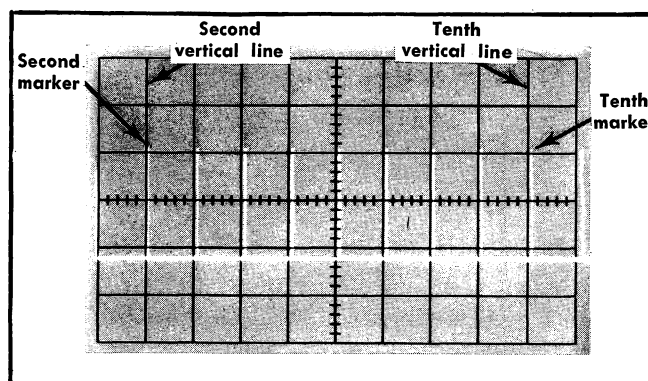


Fig. 5-4. Timing check.

### NOTE

*Unless otherwise noted, use the middle eight horizontal divisions (between the second and tenth vertical graticule lines) when checking timing.*

e. CHECK—Timing through the remaining positions of the TIME/DIV switch as shown in Table 5-2.

TABLE 5-2

TIME/DIV Setting	Time Marks	Accuracy Center 8 Div	Accuracy Any 2 Div
1 s	1 s	4%	5%
.5 s	.5 s		
.2 s	.1 s		
.1 s	.1 s		
50 ms	50 ms		
20 ms	10 ms		
10 ms	10 ms		

TABLE 5-2 (cont)

TIME/DIV Setting	Time Marks	Accuracy Center 8 Div	Accuracy Any 2 Div
5 ms	5 ms	3%	4%
2 ms	1 ms		
1 ms	1 ms		
.5 ms	.5 ms		
.2 ms	.1 ms		
.1 ms	.1 ms		
50 $\mu$ s	50 $\mu$ s		
20 $\mu$ s	10 $\mu$ s		
10 $\mu$ s	10 $\mu$ s		
5 $\mu$ s	5 $\mu$ s		
2 $\mu$ s	1 $\mu$ s		
1 $\mu$ s	1 $\mu$ s		

**18. Check Variable Time/Div Range**

a. Set Time-Mark Generator to 10 ms marker and the 326 TIME/DIV to 1 ms.

b. Set trigger controls for a stable display in the variable positive-slope area.

c. Align the markers with the first and last graticule lines.

d. Turn the Variable TIME/DIV control fully counter-clockwise.

e. CHECK—Display for four-division maximum spacing between markers.

**19. Check Magnified Timing**

Reset the controls as follows:

Horizontal POSITION	Midrange
X10 HORIZ MAG	Pulled
Time-Mark Generator	.1 ms

a. Set TRIGGERING controls in the variable-slope area for a stable display.

b. CHECK—CRT display for one marker per division between the second and tenth vertical lines. With a marker positioned exactly to the second vertical line, a marker must coincide, within 4%, with the tenth vertical line.

c. CHECK—Each TIME/DIV switch position as shown in Table 5-3.

TABLE 5-3

TIME/DIV Setting	Time-Mark Gen Output	Display Markers/Div	Max Error for Given Accuracy
1 $\mu$ s	.1 $\mu$ s	1	5% (0.4 div)
2 $\mu$ s	.1 $\mu$ s	2	
5 $\mu$ s	.1 $\mu$ s	5	4% (0.32 div)
10 $\mu$ s	1 $\mu$ s	1	
20 $\mu$ s	1 $\mu$ s	2	
50 $\mu$ s	1 $\mu$ s	5	
.1 ms	10 $\mu$ s	1	
.2 ms	10 $\mu$ s	2	
.5 ms	10 $\mu$ s	5	
1 ms	.1 ms	1	
2 ms	.1 ms	2	
5 ms	.1 ms	5	
10 ms	1 ms	1	5% (0.4 div)
20 ms	1 ms	2	
50 ms	1 ms	5	
.1 s	10 ms	1	
.2 s	10 ms	2	
.5 s	10 ms	5	
1 s	100 ms	1	

**20. Check External Horizontal**

a. Set TRIG OR HORIZ ATTEN switch (side panel) to 10X.

b. Set TIME/DIV to EXT HORIZ and TRIGGERING to EXT AC.

c. Connect the Standard-Amplitude Calibrator to the EXT TRIG OR HORIZ INPUT connector with a 50-ohm BNC cable.

## Performance Check/Adjustment—326 (SN 300500-up)

d. Set the Standard-Amplitude Calibrator for a 10-volt square-wave output.

e. CHECK—CRT display for a horizontal deflection of 4.0 div to 6.7 div between dots (1.5 volts/div to 2.5 volts/div).

f. Set the calibrator to 1 volt and switch the EXT TRIG OR HORIZ ATTEN to X1.

g. CHECK—CRT display for a horizontal deflection of 4 div to 6.7 div between dots (150 mV to 250 mV/div).

h. Rotate the EXT HORIZ VARIABLE control fully counterclockwise.

i. CHECK—CRT display for at least one tenth the deflection measured in the preceding step (indicates 10:1, or greater, range).

## 21. Check External Horizontal Bandwidth (Upper —3 dB Point)

a. Set the EXT HORIZ Variable control to CAL (clockwise).

b. Connect the low-frequency Constant-Amplitude Sine-Wave Generator to the EXT TRIG OR HORIZ INPUT connector through a 50-ohm BNC cable and a 50-ohm BNC termination.

c. Set the generator output for five divisions of horizontal deflection at 1 kHz.

d. Without changing the output amplitude, increase the output frequency of the generator to 200 kHz.

e. CHECK—CRT display for at least 3.5 divisions of horizontal display.

f. Disconnect all test equipment.

## 22. Check External Blanking

Set the controls as follows:

CH 1 VOLTS/DIV	.2
TRIGGERING	INT AC
TIME/DIV	5 $\mu$ s

a. Connect the low-frequency Sine-Wave Generator to the CH 1 VERT INPUT connector, through a BNC cable and BNC T connector.

b. Set the generator for a five-division vertical display (5-volt positive peaks) at 100 kHz.

c. Connect the output of the BNC T connector to the EXT BLANK connector with a BNC to banana patch cord.

d. CHECK—CRT display for blanking of a portion of each cycle (see Fig. 5-5). The INTENSITY control may require resetting to show the blanking.

## 23. Check High Frequency Triggering

Reset the controls as follows:

VOLTS/DIV CH 1	.1
TRIGGERING	CH 1, +AUTO
TIME/DIV	1 $\mu$ s

a. Connect the high-frequency Constant-Amplitude Sine-Wave Generator to the CH 1 VERT INPUT connector through the GR to BNC adapter, 50-ohm BNC cable, 50-ohm BNC termination, and BNC T connector. Connect the output of the BNC T connector to the EXT TRIG OR HORIZ INPUT connector with a 50-ohm BNC cable.

b. Set the generator for a 0.3 division display at 1.0 MHz.

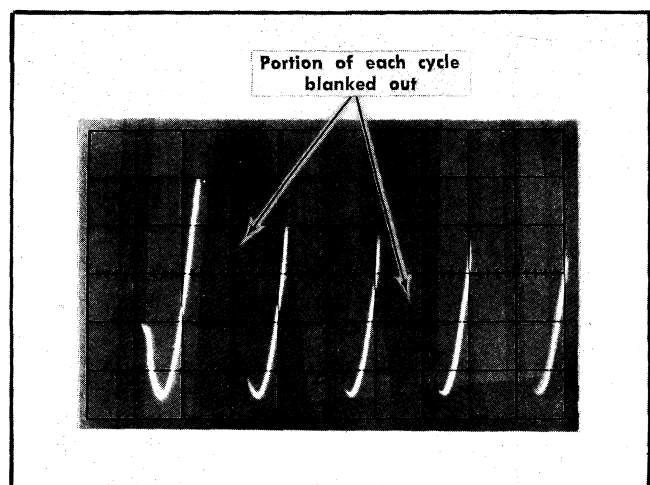


Fig. 5-5. External blanking check, typical display.

c. CHECK—Stable display is presented with the TRIGGERING controls set to INT AC and LF REJ, in the variable positive-slope area, in the variable-slope negative area, and in both +AUTO and –AUTO.

d. Set the generator for a one-division display at 10 MHz.

e. Pull the X10 HORIZ MAG knob.

f. CHECK—Stable display is presented with the TRIGGERING controls set to INT AC and LF REJ in the variable positive-slope area, in the variable negative-slope area, and in both +AUTO and –AUTO.

g. Reset the controls as follows:

TRIGGERING	EXT, AC
X10 HORIZ MAG	Pushed in

h. Set the generator for a 1.5-division display at 1.0 MHz.

i. CHECK—Stable display is presented in AC and DC in variable positive-slope area, variable negative-slope area, and in both +AUTO and –AUTO.

j. Reset the generator for a five-division display at 10 MHz.

k. Pull the X10 HORIZ MAG knob.

l. CHECK—Stable display is presented in AC and DC in the variable positive-slope area, variable negative-slope area, and in both +AUTO and –AUTO.

m. Move the signal to CH 2, switch CH 1—NORM to NORM, Mode to CH 2, and repeat steps a through l.

n. Disconnect the high-frequency generator.

## 24. Check Low-Frequency Triggering

Set the 326 controls as follows:

TIME/DIV	20 ms
X10 HORIZ MAG	Pushed in
TRIGGERING	+AUTO, CH 1

a. Connect the low-frequency Constant-Amplitude Sine-Wave Generator to the CH 1 VERT INPUT connector through the 50-ohm BNC cable, 50-ohm termination, and the 50-ohm BNC T connector. Connect the output of the BNC T connector to the EXT TRIG OR HORIZ INPUT connector with a 50-ohm BNC cable.

b. Set the low-frequency generator for a 1.5-division display (150 mV) at 30 Hz.

c. CHECK—Stable display is presented in EXT AC and DC, in the variable positive-slope, variable negative-slope area, and +AUTO and –AUTO.

d. Set the generator for a 0.3 division display at 30 Hz.

e. Set the TRIGGERING to INT AC.

f. CHECK—Stable display is presented in the variable negative-slope area, the variable positive-slope area, the +AUTO, and –AUTO positions.

## 25. Check Low-Frequency Reject

a. Change the low-frequency Sine-Wave Generator for a 0.3 division display at 15 kHz.

b. CHECK—Stable triggering can be obtained in + and –AUTO, and in variable positive- and negative-slope areas.

c. Without changing the generator output amplitude, set the frequency to 30 Hz.

d. Reset TIME/DIV to 10 ms.

e. CHECK—Stable display cannot be obtained at any setting of the TRIGGERING LEVEL/SLOPE controls.

## 26. Check Calibrator

Change the following control settings:

CH 1 VOLTS/DIV	5 DIV CAL
Input AC-DC	GND (both buttons out)
TRIGGERING	
LEVEL/SLOPE	–AUTO
Coupling	INT AC
TIME/DIV	.1 ms

## Performance Check/Adjustment—326 (SN 300500-up)

a. Set the Variable TIME/DIV control for one complete cycle in ten divisions.

b. CHECK—The display for length of the positive segment of the square wave between four and six divisions (duty cycle 40% to 60%).

c. Change the following control settings:

VOLTS/DIV	.1
Input AC-DC	DC
TIME/DIV	.5 ms
Variable VOLTS/DIV	CAL

d. Connect a 1X probe to the CH 1 INPUT connector.

e. Connect the probe tip to the CAL OUT jack.

f. CHECK—Display for five divisions of vertical amplitude.

### SHORT-FORM ADJUSTMENT PROCEDURE AND INDEX

326 Serial Number \_\_\_\_\_

Calibration Date \_\_\_\_\_

Calibrated By \_\_\_\_\_

#### 1. Adjust T970 Primary Current Page 5-14

ADJUST R942 for 3.6 A in T970 primary.

#### 2. Adjust High Voltage Supply and Check Regulation Page 5-14

ADJUST R907 for -1900 volts, within 2%.

#### 3. Adjust Intensity Limit Page 5-15

ADJUST R1046 for 315  $\mu$ A CRT cathode current.

#### 4. Adjust +5-Volt Power Supply Page 5-15

ADJUST R1004 for 0.500 volt between CAL OUT jack and chassis ground.

#### 5. Adjust -5-Volt Power Supply Page 5-15

ADJUST R1030 for -5.0 volts,  $\pm 75$  mV at -5-volt test point.

#### 6. Check Low-Voltage Power Supply Page 5-16 Ripple and Regulation

CHECK the low-voltage supplies while varying the external DC supply voltage between +9.0 and +32 volts.

#### 7. Adjust Variable Volts/Div Balance (each channel) Page 5-16

ADJUST R37 and R237 for no trace shift as Variable VOLTS/DIV is rotated.

#### 8. Adjust CH 1 Vertical X10 Balance Page 5-17

ADJUST R36 for minimum trace shift as the X10 VERT GAIN switch is pulled out and pushed in.

#### 9. Adjust CH 2 Vertical X10 Balance Page 5-17

ADJUST R236 for minimum trace shift as the X10 VERT GAIN switch is pulled out and pushed in.

#### 10. Adjust Deflection plate DC Level (each channel) Page 5-17

CHECK that trace is within  $\pm 0.3$  Div. of graticule center with Q376 and Q386 collectors shorted together.

SET Vertical POSITION control for zero meter reading between points A and B.

ADJUST R82 for a meter reading of 50 volts (Q457 collector and ground).

ADJUST R84 for a meter reading of 50 volts (Q458 collector and ground).

ADJUST R69 to center a clipped signal on the graticule. Set Vertical POSITION control for a zero meter reading between points O and P.

ADJUST R282 for a meter reading of 50 volts (Q457 collector to ground).

ADJUST R284 for a meter reading of 50 volts (Q458 collector and ground).

ADJUST R269 to center a clipped signal on the graticule.

#### 11. Adjust Astigmatism Page 5-18

ADJUST R1068 (with FOCUS) for the best marker definition.

#### 12. Adjust Trace Alignment Page 5-18

ADJUST R1060 to align marker baseline with graticule horizontal centerline.

- |  |   |
|--|---|
| <p>13. Adjust CRT Geometry <span style="float: right;">Page 5-19</span></p> <p>ADJUST R1062 for minimum curvature of markers and baseline.</p> <p>14. Adjust Limit Centering (each channel) <span style="float: right;">Page 5-19</span></p> <p>ADJUST R69 for minimum compression.</p> <p>ADJUST R269 for minimum compression.</p> <p>15. Adjust CH 1 X1 Vertical Gain <span style="float: right;">Page 5-20</span></p> <p>ADJUST R65 for 5.00 divisions of display.</p> <p>16. Adjust CH 1 X10 Vertical Gain <span style="float: right;">Page 5-20</span></p> <p>ADJUST R41 for 5.00 divisions of display.</p> <p>17. Adjust CH 2 Vertical X1 Gain <span style="float: right;">Page 5-20</span></p> <p>ADJUST R265 for 5.00 divisions of display.</p> <p>18. Adjust CH 2 Vertical X10 Gain <span style="float: right;">Page 5-20</span></p> <p>ADJUST R241 for 5.00 divisions of display.</p> <p>19. Adjust High Frequency Compensation <span style="float: right;">Page 5-20</span></p> <p>ADJUST R411 for the best front corner on the square wave top.</p> <p>ADJUST R421 for the best front corner on the square wave bottom.</p> <p>ADJUST R418, R428, C417, C427, C418, and C428 for best front corner.</p> <p>20. Adjust Input Capacitance <span style="float: right;">Page 5-21</span></p> <p>ADJUST C21 for minimum overshoot or rounding.</p> <p>ADJUST C221 for minimum overshoot or rounding.</p> <p>21. Adjust Volts/Div Switch Compensation <span style="float: right;">Page 5-22</span></p> <p>ADJUST each attenuator as shown in Table 5-5.</p> <p>22. Adjust Magnified Registration <span style="float: right;">Page 5-23</span></p> <p>ADJUST R713 for position coincidence in X1 and X10.</p> | <p>23. Adjust Normal Timing <span style="float: right;">Page 5-23</span></p> <p>ADJUST R611 midway between triggered display and auto sweep.</p> <p>ADJUST R702 for one marker per division.</p> <p>24. Adjust Sweep Length and Centering <span style="float: right;">Page 5-24</span></p> <p>ADJUST R618 for 10.7 division sweep length.</p> <p>ADJUST R704 to set trace start.</p> <p>25. Adjust Magnified Timing <span style="float: right;">Page 5-24</span></p> <p>ADJUST R717 for one marker per division.</p> <p>26. Adjust High Speed Timing <span style="float: right;">Page 5-24</span></p> <p>ADJUST C620F for 1 marker per division.</p> <p>ADJUST C701 for best sweep start linearity.</p> <p>ADJUST C782 for best sweep and linearity.</p> <p>27. Adjust External Horizontal 10X Compensation <span style="float: right;">Page 5-25</span></p> <p>ADJUST C538 for minimum rounding or overshoot.</p> <p>28. Adjust Battery Charger Charge Rate <span style="float: right;">Page 5-25</span></p> <p>ADJUST R1144 for 45 mV across R1115.</p> |
|--|---|

## ADJUSTMENT PROCEDURE

### Initial Control Settings:

INTENSITY	midrange
FOCUS	midrange
POWER	OFF
CH 1 and CH 2	
VOLTS/DIV	5 DIV CAL
POSITION	midrange
X10 VERT GAIN	pushed in
Input Coupling AC-DC	AC
Mode	CH 1
CH 2 INVERT	pushed in
TIME/DIV	.5 ms
TRIGGERING	
CH 1—NORM	CH 1
LEV/SLOPE	+AUTO
INT—EXT	INT AC
Horizontal POSITION	midrange

## Preliminary Procedure for Complete Calibration

1. Remove the Battery Charger from the 326.
2. Remove the cabinet from the 326.
3. Remove the Battery Pack.
4. Remove the Power Regulator and Regulator cover following the removal instructions in the Maintenance Section (4).
5. Connect an external DC supply to the 326 EXT DC POWER input jacks (note polarity).
6. Set the external DC supply output to +9 volts.
7. Switch the 326 POWER switch to ON.

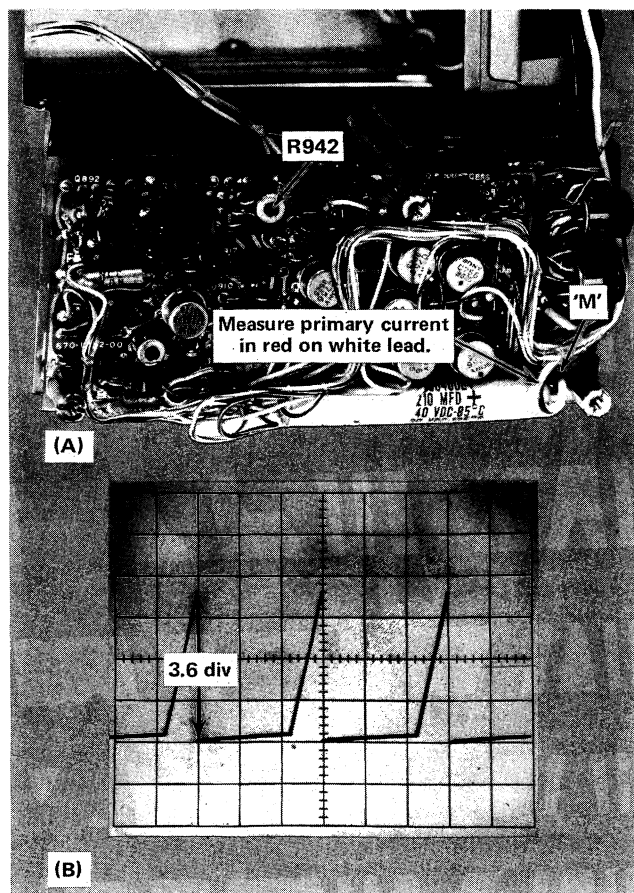


Fig. 5-6. T970 primary current adjust. (A) Location of terminal M. (B) Typical waveform.

## 1. Adjust T970 Primary Current (R942)

- a. Connect the current probe around the red-on-white lead from terminal 'M' on the Power Regulator Control Board (see Fig. 5-6A for location).
- b. Set the current probe Passive Termination for 2 mA/mV and the Test Oscilloscope vertical deflection to .5 V/Div.
- c. Observe a waveform on the test oscilloscope similar to that shown in Fig. 5-6B.
- d. ADJUST—R942 for 3.6 divisions (3.6 amp) of vertical display.
- e. Remove the current probe.

## 2. Adjust High Voltage Supply and Check Regulation

- a. Connect a DC voltmeter + lead to terminal 'O' or 'P' (see Fig. 5-7A) on H.V. board and — lead to chassis ground.

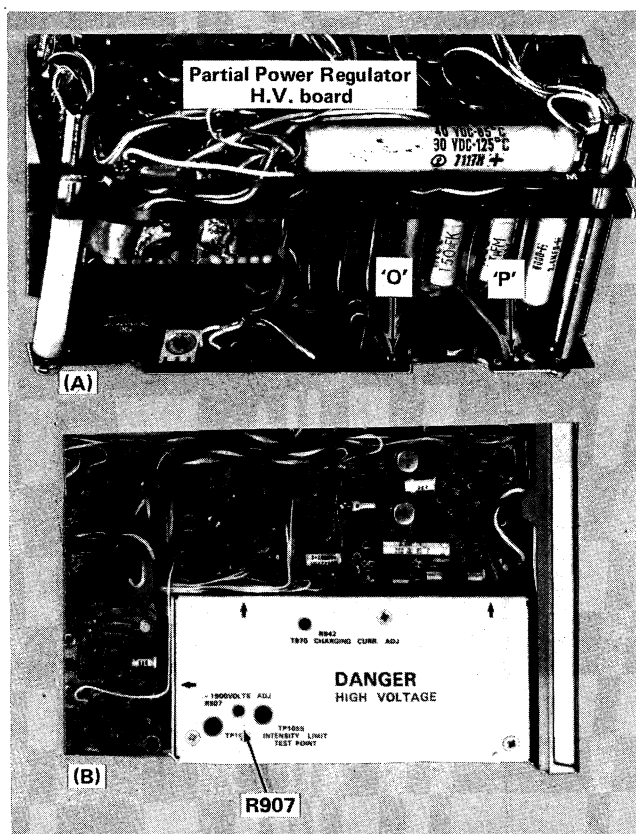


Fig. 5-7. High Voltage adjustment. Location of (A) Terminals O and P, and (B) Location of R907.

b. ADJUST—R907 (see Fig. 5-7B) for a meter reading of  $-1900$  volts.

c. Change the variable DC power source output voltage between  $+9$  and  $+32$  volts. Set the INTENSITY control fully clockwise at  $+9$  volts and fully counterclockwise at  $+32$  volts.

d. CHECK—for less than  $\pm 40$  volts change in the  $-1900$ -volt level ( $-1860$  volts to  $-1940$  volts).

#### NOTE

*If the high-voltage supply is out of regulation, check the regulation of the low-voltage supplies (steps 4 and 5) before troubleshooting the high-voltage supply.*

e. Return the variable DC power source to  $+9$  volts.

f. INTERACTION—Adjusting the  $-1900$ -volt supply will affect the display. Therefore, a complete calibration must follow.

### 3. Adjust Intensity Limit (R1046)

#### NOTE

*This step need not be performed unless display brightness is low or the CRT has been replaced. If intensity limit adjustment is changed or the CRT is replaced, be sure to recheck T970 Primary Current according to Step 1 page 5-14. To avoid burning the CRT phosphor, it is advisable to defocus the trace (FOCUS control full cw) while performing step 3.*

a. Connect a precision DC Voltmeter between TP1051 and TP1055 (See Fig. 5-8). Set TIME/DIV switch to  $1\ \mu\text{s}$ .

b. Rotate the INTENSITY control fully cw and adjust R1046 for an incremental voltage reading of  $315\ \text{mV} \pm 15.75\ \text{mV}$ . Rotate the INTENSITY control fully ccw. Remove the voltmeter connections from TP1051 and TP1055.

#### NOTE

*If intensity limit cannot be adjusted within the stated limits with R1046, select a different value of R1044. If intensity limit is too high, increase the R1044 value. If intensity limit is too low, decrease the R1044 value. Normally the correct value of R1044 will be somewhere between  $470\ \text{k}\Omega$  and  $3.9\ \text{M}\Omega$ .*

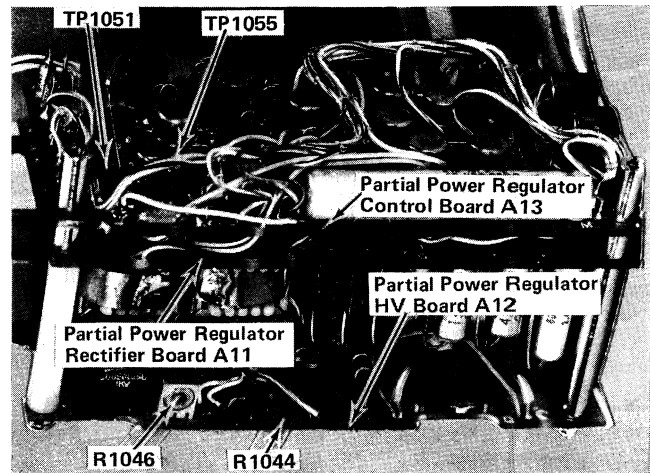


Fig. 5-8. Intensity limit adjustments and test points.

### 4. Adjust $+5$ -Volt Power Supply (R1004)

a. Connect a precision DC voltmeter between the front-panel CAL OUT jack and chassis ground.

b. Remove Q9 from its socket on the CAL/SW circuit board (see Fig. 5-9).

c. ADJUST—R1004 (see Fig. 5-9 for location) for a meter reading of  $0.500$  volt.

d. Disconnect the precision DC voltmeter and replace Q9.

e. Connect the precision DC voltmeter between terminal 'BZ' on the Horizontal board (see Fig. 5-9 for location) and chassis ground.

f. CHECK—for a meter reading of  $+5.0$  volts,  $\pm 75\ \text{mV}$ .

g. INTERACTION—may affect operation of all circuits within the instrument.

### 5. Adjust $-5$ -Volt Power Supply (R1030)

a. Connect the precision DC voltmeter between terminal 'BB' on the Horizontal board (see Fig. 5-9 for location) and chassis ground.

b. ADJUST—R1030 (see Fig. 5-9 for location) for a meter reading of  $-5$  volts,  $\pm 25\ \text{mV}$ .

c. INTERACTION—may affect operation of all circuits within the instrument.



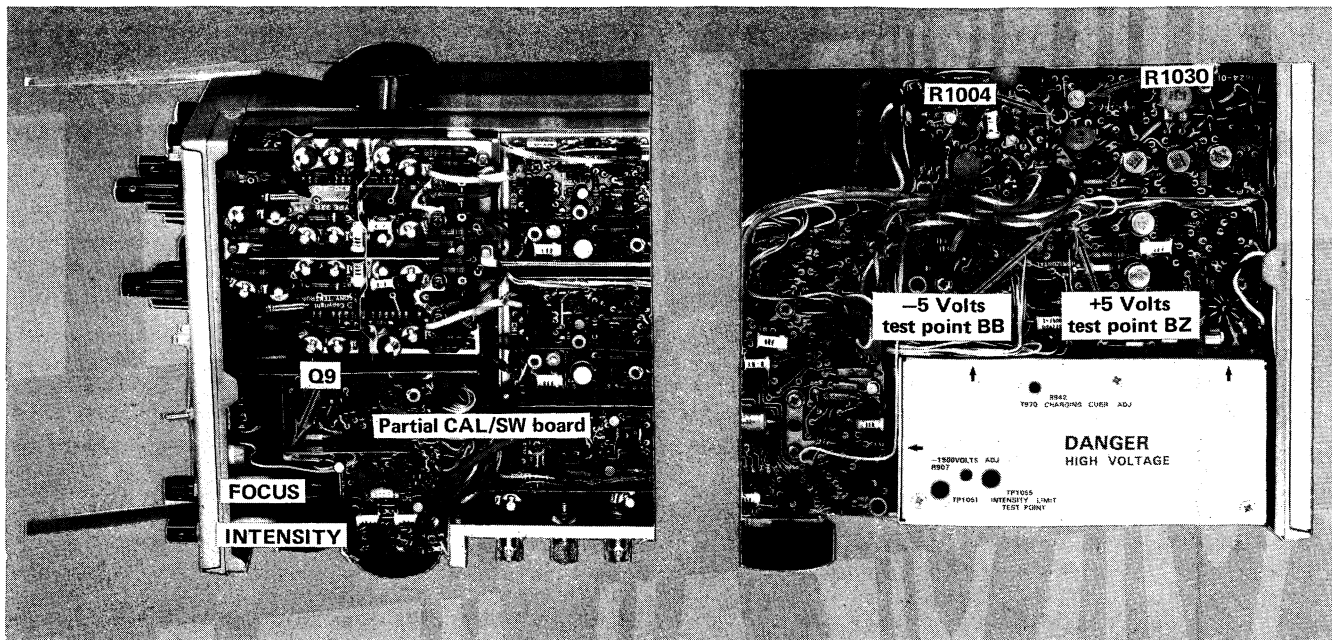


Fig. 5-9. R1030, -5 V supply adjustment and test point BB, R1004, +5 V supply adjustment and test point BZ, Q9, FOCUS, and INTENSITY locations.

## 6. Check Low-Voltage Power-Supply Ripple and Regulation

- a. Set the following 326 front-panel controls:

TIME/DIV	EXT HORIZ
Vertical POSITION	Position spot off screen

- b. Connect a 1X probe to the Test Oscilloscope vertical input.

- c. Set the Test Oscilloscope vertical deflection factor to 0.01 Volts/Div, AC Coupled, and sweep rate at 20  $\mu$ s/Div.

- d. CHECK—the Test Oscilloscope display for ripple of each supply while varying the external DC voltage supply between +9 volts and +32 volts. Table 5-4 lists the supply voltage limits, ripple limits, and location of test point for each supply. See Fig. 5-9 and 5-10.

- e. Disconnect the external DC supply and replace the Power Regulator in the 326. Reconnect the external DC supply or replace the internal battery pack.

TABLE 5-4

Supply	Voltage Limits	Maximum Ripple	Location of Test Point
-5 V	Within 2%	10 mV	'BB' on Horiz Board
+5 V	Within 2%	10 mV	'BZ' on Horiz Board
+14 V	$\pm 20\%$	200 mV	'BD' on Horiz Board
+100 V	$\pm 5\%$	750 mV	'L' on Rect Board
+165 V	+8%, -6%	750 mV	'K' on Rect Board

## 7. Adjust Variable Volts/Div Balance (R37-R237)

- a. Set the 326 Mode switch to CH 1.

- b. Vertically position the trace to the center graticule line.

- c. Rotate the CH 1 Var VOLTS/DIV control through-out its range noting the vertical trace shift.

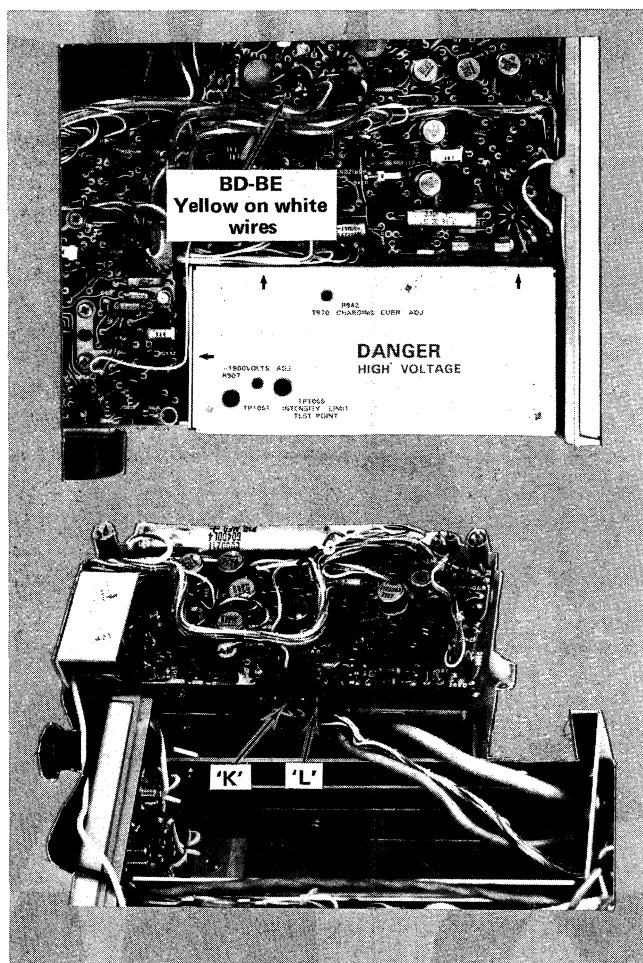


Fig. 5-10. Location of test points BD, BE, K & L.

d. ADJUST—R37 (see Fig. 5-11B) for no trace shift as the Variable VOLTS/DIV control is rotated. If necessary, use the Vertical POSITION control to keep the trace on screen during this adjustment. Set Mode to CH 2.

e. Rotate CH 2 Var VOLTS/DIV throughout its range.

f. ADJUST—R237 (see Fig. 5-11B) for no trace shift as the CH 2 Var VOLTS/DIV control is turned.

g. Return both CH 1 and CH 2 Var VOLTS/DIV controls to the CAL position.

h. Set Mode switch to CH 1.

## 8. Adjust CH 1 Vertical X10 Balance (R36)

a. Vertically position the CH 1 trace to the center horizontal line.

b. Pull the CH 1 X10 VERT GAIN switch and check trace shift as the knob is pulled.

c. ADJUST—R36 (see Fig. 5-11B) for minimum trace shift as the X10 VERT GAIN switch is pulled out and pushed in. To prevent changing the knob position (rotational) the X10 VERT GAIN switch can be actuated using the control bracket behind the front panel.

d. Push the CH 1 X10 VERT GAIN switch in and switch Mode to CH 2.

## 9. Adjust CH 2 Vertical X10 Balance (R236)

a. Vertically position the CH 2 trace to the center horizontal graticule line.

b. Pull the CH 2 X10 VERT GAIN switch and check trace shift as the knob is pulled out.

c. ADJUST—R236 (see Fig. 5-11B) for minimum trace shift as the X10 VERT GAIN switch is pulled out and pushed in. To prevent changing the knob position (rotational) the X10 VERT GAIN switch can be actuated using the control bracket behind the front panel.

d. Push the CH 2 X10 VERT GAIN switch in. Switch Mode to CH 1.

## 10. Adjust Deflection Plate DC Level R82-R84-R69 for CH 1, (R282-R284-R269 for CH 2)

a. CHECK—Vertical Trace Position: Connect a shorting strap between the collector of Q376 and the collector of Q386. Check that the vertical position of the trace is within  $\pm 0.3$  division of graticule center (if it is not, select Q415-Q425 and Q410-Q420 for pair combinations whose DC parameters meet this requirement).

b. ADJUST—Deflection Plate DC Level: Connect a DC Voltmeter (set for 10 V range) between terminal point B, the R74-R75 junction and terminal point A, the R76-R75 junction on the Vertical Preamp board (for CH 2 these are terminal point P, the R274-R275 junction and terminal point O, the R276-R275 junction). See Fig. 5-11 or Fig. 7-4 (A3 board photo on reverse side of diagram 1) for component and test point locations.

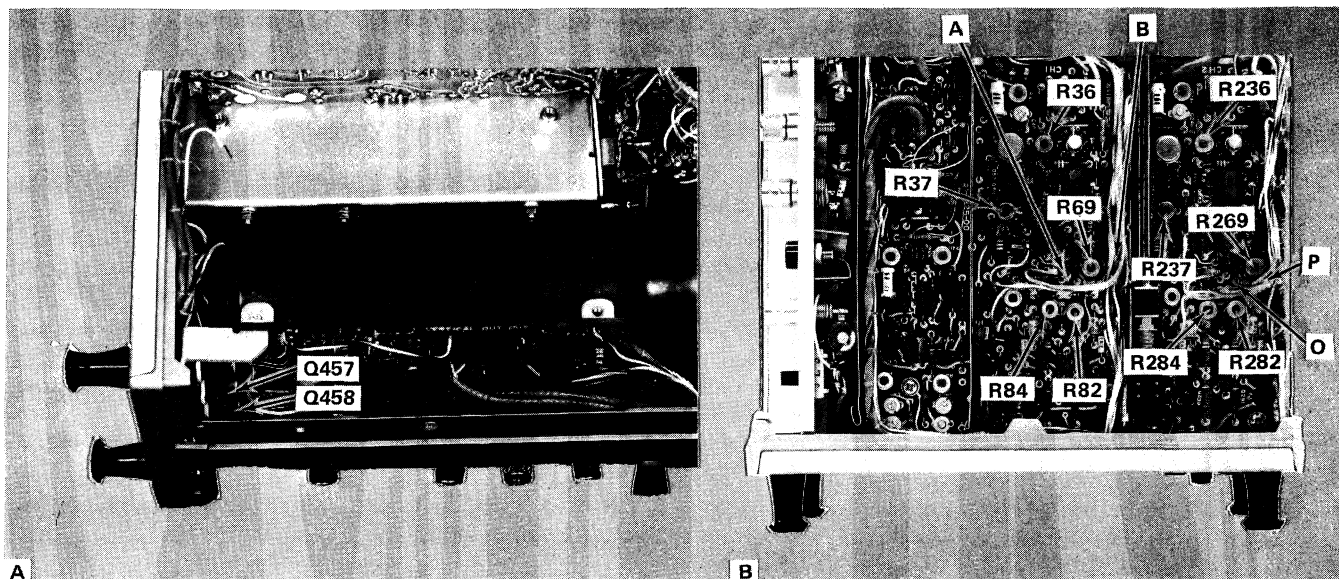


Fig. 5-11. Deflection Plate DC Level adjustment. Location of controls.

Set the Vertical POSITION control for zero voltage reading, then disconnect the voltmeter leads from the test points.

c. Connect the DC voltmeter (set for 100 V range) between ground and the collector of Q457. Adjust R82 (R282) for a reading of +50 V. Connect the DC voltmeter between ground and the collector of Q458. Adjust R84 (R284) for a reading of +50 V. Repeat these adjustments to compensate for any interaction.

d. ADJUST—Limit Centering: Connect the Type 191 (or equivalent) sine-wave generator through the GR to BNC adapter, 50  $\Omega$  BNC cable, 10X 50  $\Omega$  BNC attenuator, and a 50  $\Omega$  BNC termination to the appropriate VERT INPUT connector. Set the 191 to 50 kHz and depress the appropriate DC coupling switch on the 326. Connect a 10X probe from the test oscilloscope between ground and the collector of Q457. Increase the Type 191 amplitude until the signal at the collector of Q457 begins to clip (equal clipping on top and bottom). Adjust R69 (R269) to position the signal so it is centered vertically on the graticule of the test oscilloscope. Repeat steps 10c and 10d to maintain +50 V at the collectors of Q457 and Q458 with no signal input, and a vertically centered display with a slightly clipped signal.

e. Perform steps 10b through 10d for CH 2 using the adjustments listed in parenthesis—(R282 etc.) with the sine-wave generator connected to the CH 2 INPUT.

## 11. Adjust Astigmatism (R1068)

Reset the following 326 controls:

Mode	CH 1
CH 1 VOLTS/DIV	.5
CH 1 AC-GND-DC	DC
TIME/DIV	1 ms

a. Set the INTENSITY control midway between a barely visible trace and fully clockwise.

b. Connect a Time-Mark Generator (set to 1 ms markers) to the CH 1 VERT INPUT connector (use BNC cable). Trigger as necessary for stable display.

c. ADJUST—FOCUS (front panel) and Astig (R1068) controls (see Fig. 5-12A) for the best definition of the markers within the areas indicated in Fig. 5-12B.

## 12. Adjust Trace Alignment (R1060)

a. Vertically position the marker display baseline to the graticule horizontal centerline.

b. ADJUST—R1060, Trace Rotation control (see Fig. 5-12A) to align the marker display baseline parallel to the graticule horizontal centerline.

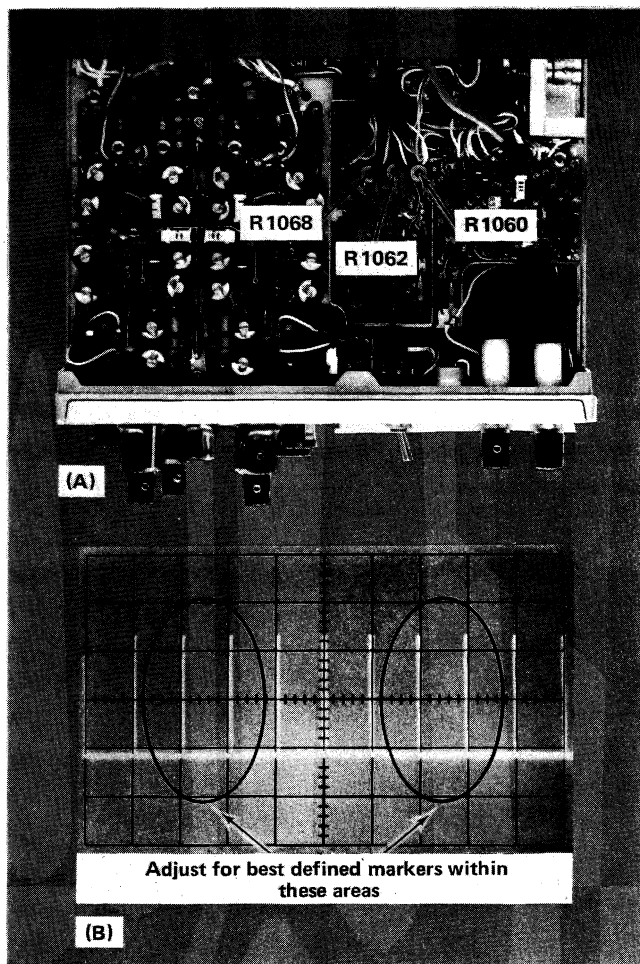


Fig. 5-12. (A) Location of Astigmatism, Trace Alignment, and Geometry controls and (B) Typical display.

### 13. Adjust CRT Geometry (R1062)

Set CH 1 VOLTS/DIV switch to .1.

- Vertically position the marker display baseline below the bottom of the graticule.
- Adjust the INTENSITY control as necessary for normal viewing brightness.
- ADJUST—R1062, Geometry control (see Fig. 5-12A) for minimum curvature of the vertical markers.
- Disconnect the Time-Mark Generator from the instrument.
- Set the TRIGGERING LEVEL/SLOPE control to +AUTO.

### Performance Check/Adjustment—326 (SN 300500-up)

- Vertically position the trace to the top graticule line.
- Trace deviation from a straight line should not exceed 1/2 minor division.
- Vertically position the trace to the bottom graticule line.
- Trace deviation from a straight line should not exceed 1/2 minor division.

#### NOTE

*It may be necessary to compromise the setting of R1062 to provide acceptable displays in steps c, g, and i.*

### 14. Adjust Limit Centering (R69 and R269)

Set CH 1 and CH 2 VOLTS/DIV to 5 DIV CAL.

Set Mode to CH 1.

- Vertically position the bottom of the display to the first graticule line below the center line.
- Reduce the display amplitude to two divisions, using the Var VOLTS/DIV control.
- Vertically position the top of the display to the top graticule line and check for compression (decrease in display amplitude).
- Vertically position the bottom of the display to the bottom graticule line and check for compression.
- ADJUST—R69, Limit Centering control, for least compression. Compression should not exceed 0.15 division. See Fig. 5-13 for location of R69 and R269.
- Set Mode switch to CH 2 and repeat steps a through d.
- ADJUST—R269, Limit Centering control, for least compression.

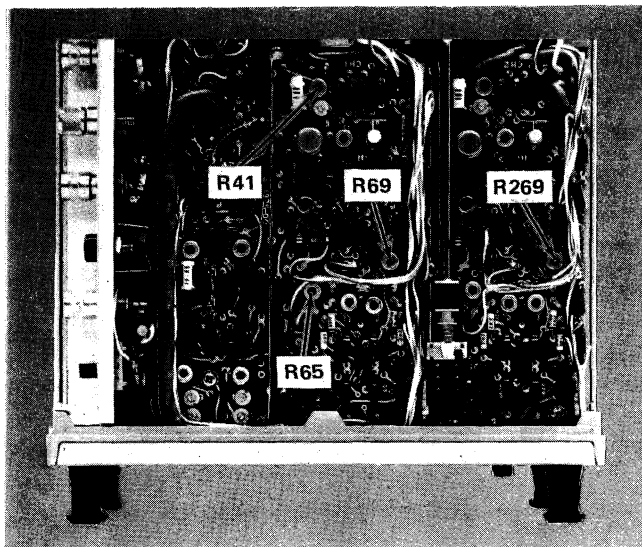


Fig. 5-13. Location of Limit Centering and Vertical Gain controls.

### 15. Adjust CH 1 Vertical Gain (R65)

Set the 326 controls as follows:

CH 1 VOLTS/DIV	.01
Var	CAL
Mode	CH 1
CH 1—NORM	CH 1

a. Connect the Standard Amplitude Calibrator output to CH 1 VERT INPUT connector via a 50  $\Omega$  BNC cable.

b. Set the Standard Amplitude Calibrator for a 50-mV square-wave output.

c. Vertically center the display about the center horizontal graticule line.

d. ADJUST—R65, X1 Vertical Gain adjustment, for 5.00 divisions of display. See Fig. 5-13 for location of Gain controls.

### 16. Adjust CH 1 X10 Vertical Gain (R41)

a. Reset the Standard Amplitude Calibrator to 5 mV, and pull the 326 CH 1 X10 VERT GAIN control.

b. Vertically center the display about the center horizontal graticule line.

c. ADJUST—R41, Vertical X10 Gain, for 5.00 divisions of display.

### 17. Adjust CH 2 X1 Vertical Gain (R265)

Reset the following controls:

Mode	CH 2
CH 1—NORM	NORM
CH 2 VOLTS/DIV	.01
Standard Amplitude Calibrator	50 mV

a. Connect the Standard Amplitude Calibrator output to CH 2 VERT INPUT connector.

b. Vertically center the display about the center horizontal graticule line.

c. ADJUST—R265, Vertical X1 Gain, for 5.00 divisions of display.

### 18. Adjust CH 2 X10 Vertical Gain (R241)

Reset Standard Amplitude Calibrator for 5 mV output and pull CH 2 X10 VERT GAIN control.

a. Vertically center the display about the center graticule line.

b. ADJUST—R241, Vert X10 Gain, for exactly 5 divisions of display.

### 19. Adjust High Frequency Compensation

Reset the following controls:

CH 1 VERT GAIN	pushed in
CH 1 VOLTS/DIV	1 volt
Mode	CH 1
CH 1—NORM	CH 1
TIME/DIV	1 $\mu$ s

a. Connect the Square-Wave Generator Fast-Rise +Output connector to the 326 CH 1 VERT INPUT connector through a GR to BNC adapter; 42-inch, 50  $\Omega$ , BNC cable; 50  $\Omega$ , 10X, BNC attenuator; and a 50  $\Omega$  BNC termination.

b. Set the Square-Wave Generator for a four-division, 100 kHz display on the 326.

c. Move the leading edge of the square wave into the viewing area.

## Performance Check/Adjustment—326 (SN 300500-up)

d. Set the Test Oscilloscope for 1 Volt/Div and 2  $\mu$ s/Div.

e. Connect the Test Oscilloscope 10X probe tip to Q457 collector (case). See Fig. 5-14A for location.

f. ADJUST—R411 for best front corner of the flat top on the Test Oscilloscope display.

g. Connect the probe tip to Q458 collector.

h. ADJUST—R421 for best front corner of the flat bottom on the Test Oscilloscope display.

i. PULL X10 HORIZ MAG.

j. ADJUST—R418, R428, C417, C427, C418, and C428 for best front corner. See Fig. 5-14B for location of controls.

k. ADJUST—C40, CH 1 Vertical Amp board, for best front corner. See Fig. 5-14B for location of C40 and C240.

l. Move the signal source from CH 1 to CH 2 and switch Mode to CH 2 and TRIGGERING from CH 1 to NORM.

m. ADJUST—C240, CH 2 Vertical Amp board, for best front corner. See Fig. 5-14C for typical waveform indicating correct high frequency adjustment.

## 20. Adjust Input Capacitance (C21-C221)

Reset the following 326 controls:

CH 1—CH 2 VOLTS/DIV	.01
Mode	CH 1
TIME/DIV	.5 ms
CH 1—NORM	CH 1

a. Install the calibration shield on the 326.

b. Connect the Square-Wave Generator High-Amplitude +Output to the CH 1 VERT INPUT connector through a GR to BNC adapter; 42-inch, 50  $\Omega$ , BNC cable; 10X, 50  $\Omega$ , BNC attenuator; 50  $\Omega$ , BNC termination; and 47 pF Input RC Normalizer, in the order given.

c. Set the Square-Wave Generator for a five-division display at 1 kHz.

d. ADJUST—C21 (see Fig. 5-15A for location) for minimum overshoot and rounding of the leading edge of the square wave as shown in Fig. 5-15B.

Reset Mode switch to CH 2. Connect the square-wave signal to CH 2 VERT INPUT. Switch CH 1—NORM to NORM.

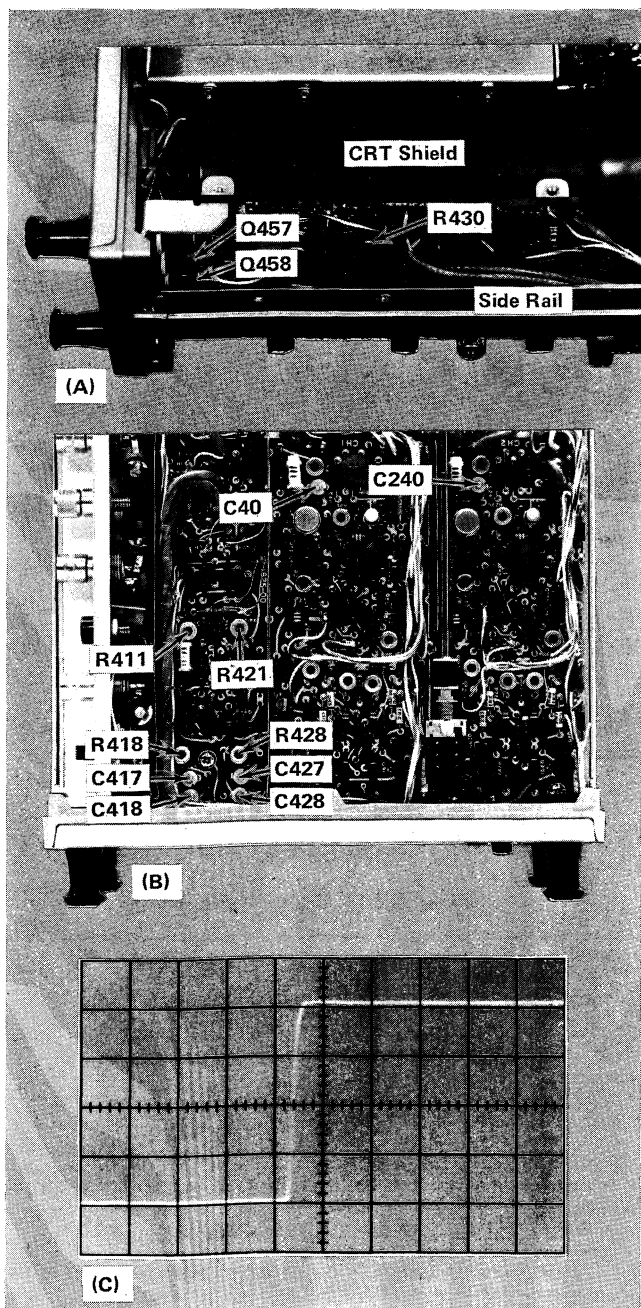


Fig. 5-14. High frequency compensation adjustment. (A) Location of test points, (B) Location of controls, and (C) Typical waveform.



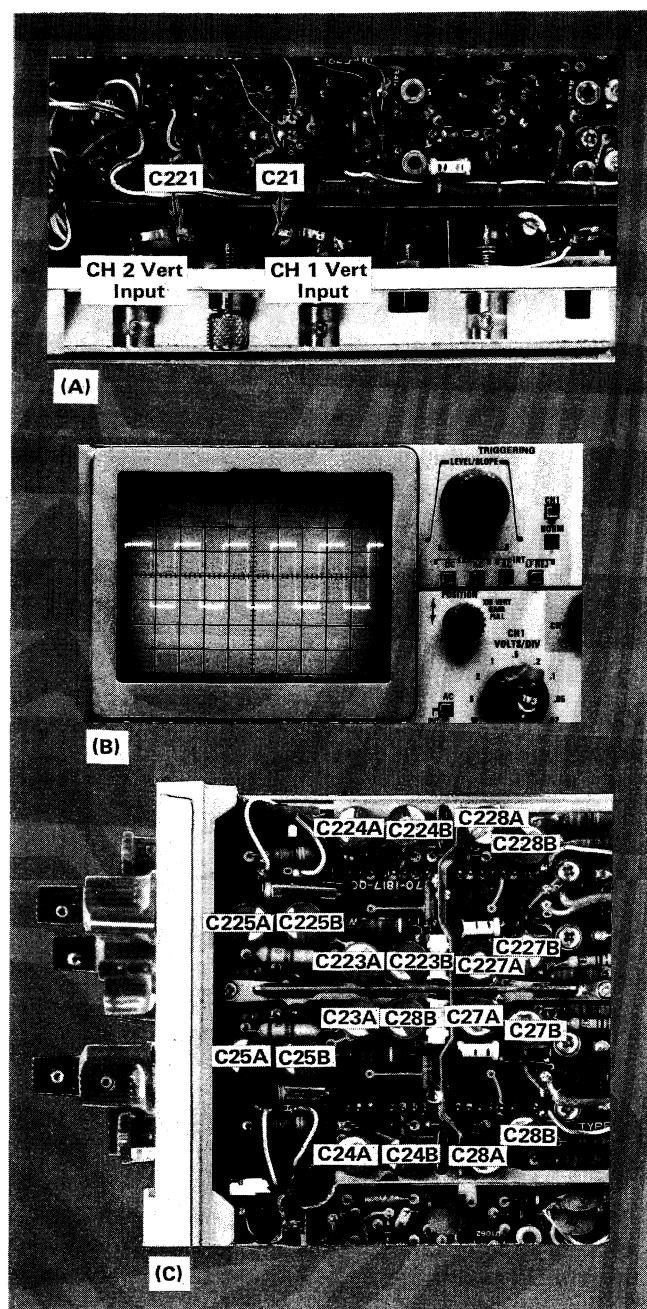


Fig. 5-15. Input capacitance adjustment (A) Location of controls, (B) Typical waveform, and (C) Location of Volts/Div switch compensation.

e. ADJUST—C221 for minimum overshoot and rounding of the leading edge of the square wave as shown in Fig. 5-15B.

f. Remove the signal and the 47 pF Input RC Normalizer.

## 21. Adjust Volts/Div Switch Compensation

Reset the following 326 controls:

CH 1 VOLTS/DIV	0.1
CH 1—NORM	CH 1

a. Connect the P6049A Probe to the 326 CH 1 VERT INPUT connector.

b. Install a GR to BNC adapter; 10X, 50  $\Omega$ , BNC attenuator; and BNC to Binding Post adapter on the Square-Wave Generator High-Amplitude Output connector in the order given.

c. Connect the P6049A Probe tip to the binding post adapter.

d. Set the square wave generator for a five-division display at 1 kHz.

e. Compensate the probe as described in the probe instruction manual.

f. ADJUST and CHECK—VOLTS/DIV switch compensation as detailed in Table 5-5 (use low-capacitance screwdriver). First adjust for best square corner and then for flat top (see Fig. 5-15C for location of controls).

g. Set CH 2 VOLTS/DIV to 0.1 and CH 1—NORM to NORM.

h. Move the probe to CH 2 VERT INPUT and repeat steps d through f for CH 2 (adjust C223 through C228).

TABLE 5-5

VOLTS/DIV Compensation

VOLTS/DIV Setting	Attenuator Compensated	Adjust for	
		Square Corner	Flat Top
.01	X1	Compensate Probe	
.02	X2	C27B	C27A
.05	X5	C28B	C28A
Remove external 10X attenuator			
.1	X10	C23B	C23A
.2	Check	If out of tolerance, compromise setting at .1 and .2 for best overall response.	

TABLE 5-5 (cont)

VOLTS/DIV Setting	Attenuator Compensated	Adjust for	
		Square Corner	Flat Top
.5	Check	If out of tolerance, compromise setting at .1, .2, and .5 for best overall response.	
1	X100	C24B	C24A
2	Check	If out of tolerance, compromise setting at 1 and 2 for best overall response.	
Pull 10X VERT GAIN switch			
5	Check	If out of tolerance, compromise setting at 1, 2, and 5 for best overall response.	
10	X200	C25B	C25A

i. Disconnect all test equipment.

j. Remove Calibration Shield.

## 22. Adjust Magnified Registration (R713)

Reset the following controls:

VOLTS/DIV	.5
CH 1 INPUT	DC
Mode	CH 1
CH 1—NORM	CH 1

a. Connect the Time-Mark Generator to CH 1 VERT INPUT connector through a 42-inch, 50  $\Omega$ , BNC cable and a 50  $\Omega$  termination.

b. Set the Time-Mark Generator for 5 ms markers and set the 326 TRIGGERING controls for a stable display.

c. Position the middle marker (three markers displayed) to the center vertical graticule line.

d. Pull the X10 HORIZ MAG switch. To prevent changing knob position (rotational) the X10 HORIZ MAG switch can be actuated using the Horizontal Position control bracket behind the front panel.

e. ADJUST—R713 (see Fig. 5-16A for location) to position the middle marker to the center vertical line.

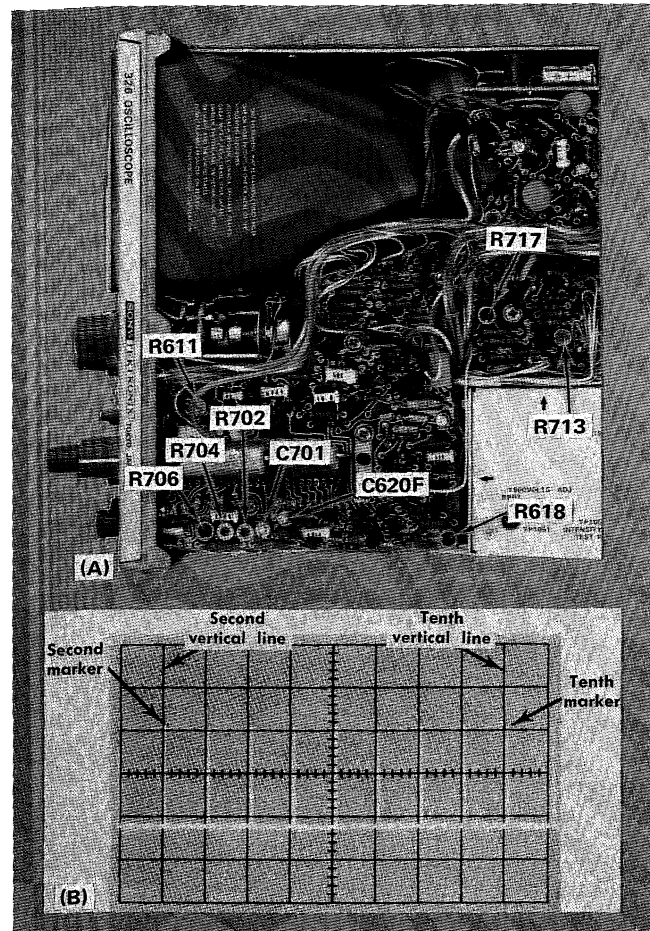


Fig. 5-16. (A) Timing Adjustments and controls. (B) Typical Waveform.

f. Push the X10 HORIZ MAG switch in.

## 23. Adjust Normal Timing

a. Set R611 (see Fig. 5-16A) midway between just triggered display and auto sweep (remove signal to determine auto sweep).



## Performance Check/Adjustment—326 (SN 300500-up)

- b. Set the Time-Mark Generator for 1 ms markers.
- c. Set TRIGGERING controls for stable display.

### NOTE

*Unless otherwise noted, use the middle eight horizontal divisions (between the second and tenth vertical graticule lines) when checking or adjusting timing.*

- d. ADJUST—R702, X1 Gain (see Fig. 5-16A for location) for one marker per division over the center eight divisions. The first and ninth markers must coincide exactly with their respective graticule lines (reposition horizontally as needed). See Fig. 5-17.

## 24. Adjust Sweep Length and Centering (R618-R704)

- a. Adjust the TRIGGERING controls for a stable display.
- b. Set the tenth marker (see Fig. 5-17) to the tenth vertical graticule line.
- c. ADJUST—R618 (see Fig. 5-16A), Sweep Length adjustment, for a sweep length of 10.7 divisions (0.7 division of display to the right of the tenth marker).
- d. Turn the Horizontal POSITION control fully clockwise.

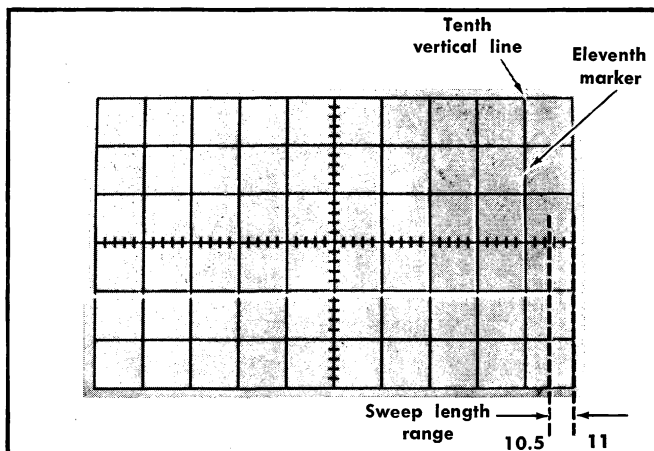


Fig. 5-17. Adjusting sweep length and centering. Typical waveform.

- e. ADJUST—R704 (see Fig. 5-16A), Position Centering, to move the first marker two and one-half divisions to the right of graticule center.

- f. Turn the Horizontal POSITION control fully counter-clockwise and check for approximately two and one-half divisions from end of trace to graticule center.

- g. ADJUST—R704 (if necessary) to set the distance from trace start to the center graticule line equal to the distance from end of trace to graticule center.

- h. INTERACTION—R702 may have to be readjusted slightly to correct timing.

## 25. Adjust Magnified Timing (R717)

- a. Set the Time-Mark Generator for .1 ms markers.
- b. Set the 326 Horizontal POSITION control to mid-range and pull the X10 HORIZ MAG knob.
- c. ADJUST—R717 (see Fig. 5-16A), X10 Gain adjustment, for one marker per division over the center eight divisions. The second and tenth markers must coincide exactly with their respective graticule lines.

## 26. Adjust High Speed Timing

Reset the following 326 controls:

TIME/DIV	1 $\mu$ s
X10 HORIZ MAG	PULL
Horizontal POSITION	midrange

Set the Time Mark Generator for .1  $\mu$ s markers.

- a. Observe approximately 1 marker per division displayed on 326.
- b. ADJUST—C620F (see Fig. 5-16A) for best timing (1 marker per division).
- c. Horizontally position the trace start to the viewing area.
- d. ADJUST—C701 and R706 (see Fig. 5-16A) for best sweep start linearity.

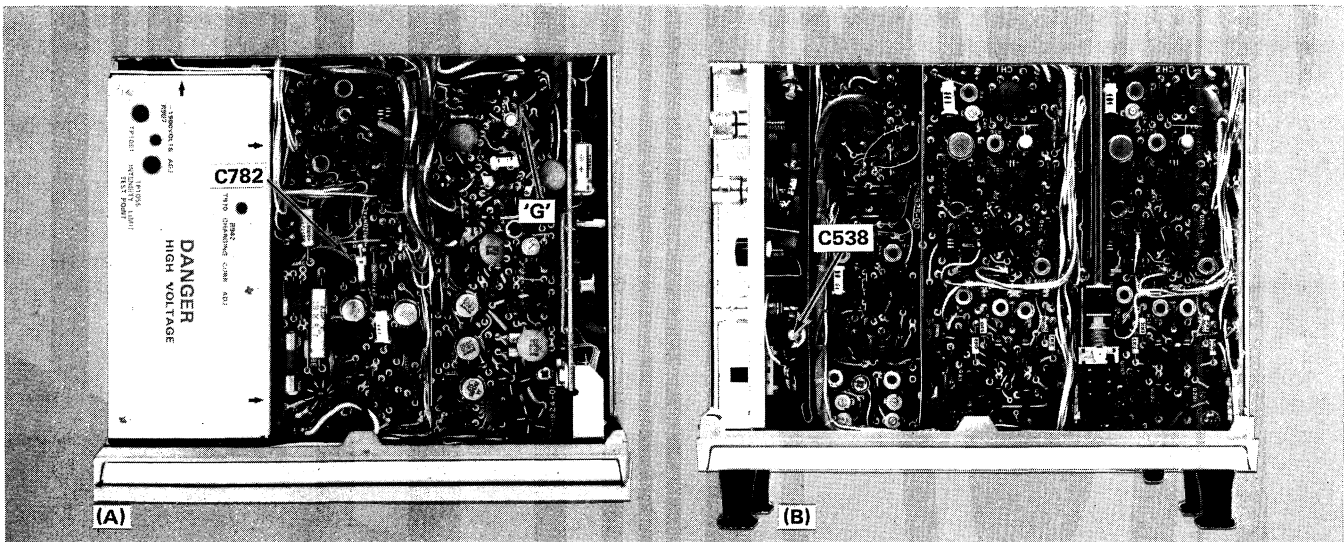


Fig. 5-18. Location of (A) Ext Horiz 10X Compensation test point 'G', C782, and (B) C538.

e. Horizontally position the end of trace to the viewing area.

f. ADJUST—C782 for best sweep end linearity. See Fig. 5-16A and B for location of controls.

## 27. Adjust External Horizontal 10X Compensation (C538)

Set the 326 controls as follows:

TIME/DIV	EXT HORIZ
TRIGGERING	EXT DC
HORIZ MAG	Pushed in
EXT HORIZ ATTEN (side panel)	X10

a. Connect the Standard Amplitude Calibrator to EXT TRIG OR HORIZ INPUT. Set Standard Amplitude Calibrator for a 5-volt square wave.

b. Connect a properly compensated probe to the Test Oscilloscope Input.

c. Set the Test Oscilloscope for a vertical deflection factor of .02 Volt/Div and a sweep rate of .5 ms/Div.

d. Connect the probe tip to point G on the 326 Horizontal Circuit board (see Fig. 5-18A for location).

e. ADJUST—C538 (see Fig. 5-18B) for the best square wave (minimum rounding or overshoot). Use a low capacitance screwdriver.

## 28. Adjust Battery Charger Charge Rate

a. Plug the battery charger banana plugs into the battery pack jacks, being sure that polarity is correct (mount the charger in the same position, relative to the battery pack, that it would be in if charging the battery pack in the instrument).

b. Connect a banana-banana patchcord from the negative battery pack output terminal to the negative external DC supply banana plug. See Fig. 5-19.

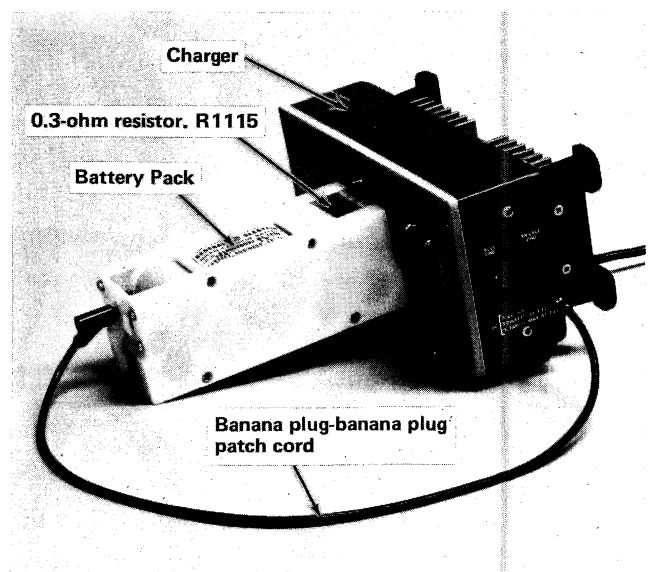


Fig. 5-19. Ground connection required to charge Battery Pack outside of instrument.

**Performance Check/Adjustment—326 (SN 300500-up)**

c. Connect a precision DC voltmeter across the 0.3-ohm resistor (R1115) in the battery pack.

d. Set the FULL CHG—TRICKLE switch to FULL CHG.

e. Plug the AC power cord into the variable line voltage source set to 115 volts.

f. ADJUST—R1144 for 0.045 volt (150 mA charge rate) across R1115 (0.3 ohms).

g. Vary the line voltage between 90 and 136 volts.

h. CHECK—Voltage drop across R1115 should not vary more than  $\pm 5$  mV.

i. Switch the FULL CHG—TRICKLE switch to TRICKLE.

j. CHECK—For approximately 13 mV across R1115.

# ELECTRICAL PARTS LIST

Replacement parts should be ordered from the Tektronix Field Office or Representative in your area. Changes to Tektronix products give you the benefit of improved circuits and components. Please include the instrument type number and serial number with each order for parts or service.

## ABBREVIATIONS AND REFERENCE DESIGNATORS

A	Assembly, separable or repairable	FL	Filter	PTM	paper or plastic, tubular molded
AT	Attenuator, fixed or variable	H	Heat dissipating device (heat sink, etc.)	R	Resistor, fixed or variable
B	Motor	HR	Heater	RT	Thermistor
BT	Battery	J	Connector, stationary portion	S	Switch
C	Capacitor, fixed or variable	K	Relay	T	Transformer
Cer	Ceramic	L	Inductor, fixed or variable	TP	Test point
CR	Diode, signal or rectifier	LR	Inductor/resistor combination	U	Assembly, inseparable or non-repairable
CRT	cathode-ray tube	M	Meter	V	Electron tube
DL	Delay line	Q	Transistor or silicon-controlled rectifier	Var	Variable
DS	Indicating device (lamp)	P	Connector, movable portion	VR	Voltage regulator (zener diode, etc.)
Elect.	Electrolytic	PMC	Paper, metal cased	WW	wire-wound
EMC	electrolytic, metal cased	PT	paper, tubular	Y	Crystal
EMT	electrolytic, metal tubular				
F	Fuse				

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
<b>ASSEMBLIES</b>				
A1	670-1829-00			CH 1 AC-DC Circuit Board Assembly
A2	670-1830-00			CH 2 AC-DC Circuit Board Assembly
A3	670-1825-01			VERTICAL PREAMP. Circuit Board Assembly
A4A	670-2417-00			CAL SWITCHING Circuit Board Assembly
A4B	670-2416-01			ATTENUATOR Circuit Board Assembly
A5	670-1823-01			VERTICAL OUTPUT Circuit Board Assembly
A6	670-1827-00			TRIGGER SOURCE Circuit Board Assembly
A7	670-1828-00			TRIGGER SOURCE COUPLING Circuit Board Assembly
A8	670-1818-01			TRIGGER-SWEEP Circuit Board Assembly
A9	670-1819-01			TIMING Circuit Board Assembly
A10	670-1824-01			HORIZONTAL Circuit Board Assembly
A11	670-1821-01			POWER REGULATOR-RECTIFIER Circuit Board Assembly
A12	670-1820-01			POWER REGULATOR-HV Circuit Board Assembly
A13	670-1822-01			POWER REGULATOR-CONTROL Circuit Board Assembly
A14	670-1826-00			BATTERY CHARGER Circuit Board Assembly
<b>BATTERY</b>				
BT1115	146-0018-00			Battery, set of 9 NiCd cells
<b>CAPACITORS</b>				
C1	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C2	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C3	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C5	283-0023-00			0.1 $\mu$ F, Cer, 10 V, +80%-20%
C6	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C7	290-0114-02			47 $\mu$ F, Elect., 6 V, 10%
C8	290-0114-02			47 $\mu$ F, Elect., 6 V, 10%
C19	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C20	285-0841-00			0.0185 $\mu$ F, PTM, 500 V, 10%
C21	281-0193-00			2-8 pF, Var, Cer
C23A	281-0195-00			5.5-18 pF, Var, Cer

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
CAPACITORS (cont)				
C23B	281-0194-00			2-8 pF, Var, Cer
C23C	281-0600-00			35 pF, Cer, 10%
C24A	281-0195-00			5.5-18 pF, Var, Cer
C24B	281-0194-00			2-8 pF, Var, Cer
C24C	283-0597-01			470 pF, Mica, 300 V, 10%
C25A	281-0195-00			5.5-18 pF, Var, Cer
C25B	281-0194-00			2-8 pF, Var, Cer
C25C	283-0685-00			1000 pF, Mica, 300 V, 10%
C27A	281-0194-00			2-8 pF, Var, Cer
C27B	281-0195-00			5.5-18 pF, Var, Cer
C27C	281-0592-00			4.7 pF, Cer, $\pm 0.5$ pF
C27D	283-0201-00			27 pF, Cer, 200 V, 10%
C28A	281-0195-00			5.5-18 pF, Var, Cer
C28B	281-0194-00			2-8 pF, Var, Cer
C30	283-0068-00			0.01 $\mu$ F, Cer, 500 V, +100%-0%
C31	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C40	281-0122-00			2.5-9 pF, Var, Cer, 100 V
C41	281-0622-00			47 pF, Cer, 500 V, 1%
C48	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C95	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C201	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C202	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C207	290-0114-02			47 $\mu$ F, Elect., 6 V, 10%
C208	290-0114-02			47 $\mu$ F, Elect., 6 V, 10%
C220	285-0841-00			0.0185 $\mu$ F, PTM, 500 V, 10%
C221	281-0193-00			2-8 pF, Var, Cer
C223A	281-0195-00			5.5-18 pF, Var, Cer
C223B	281-0194-00			2-8 pF, Var, Cer
C223C	281-0600-00			35 pF, Cer, 10%
C224A	281-0195-00			5.5-18 pF, Var, Cer
C224B	281-0194-00			2-8 pF, Var, Cer
C224C	283-0597-01			470 pF, Mica, 300 V, 10%
C225A	281-0195-00			5.5-18 pF, Var, Cer
C225B	281-0194-00			2-8 pF, Var, Cer
C225C	283-0685-00			1000 pF, Mica, 300 V, 10%
C227A	281-0194-00			2-8 pF, Var, Cer
C227B	281-0195-00			5.5-18 pF, Var, Cer
C227C	281-0592-00			4.7 pF, Cer, $\pm 0.5$ pF
C227D	283-0201-00			27 pF, Cer, 200 V, 10%
C228A	281-0195-00			5.5-18 pF, Var, Cer
C228B	281-0194-00			2-8 pF, Var, Cer
C230	283-0068-00			0.01 $\mu$ F, Cer, 500 V, +100%-0%
C231	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C240	281-0122-00			2.5-9 pF, Var, Cer
C241	281-0622-00			47 pF, Cer, 500 V, 1%
C248	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C332	283-0028-00			0.0022 $\mu$ F, Cer, 50 V
C334	285-0685-00			0.0068 $\mu$ F, PTM, 100 V, 10%
C335	281-0518-00			47 pF, Cer, 500 V, 20%
C342	283-0028-00			0.0022 $\mu$ F, Cer, 50 V
C345	281-0518-00			47 pF, Cer, 500 V, 20%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C350	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C352	283-0230-00			470 pF, Cer, 500 V, 20%
C361	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C390	281-0600-00	X300706		35 pF, Cer, 10%
C397	283-0111-00			0.1 $\mu$ F, Cer, 50 V
C400	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C411	281-0630-00	300500	301299	390 pF, Cer, 500 V, 5%
C411	283-0231-00	301300		470 pF, Cer, 500 V, 10%
C413	283-0231-00			470 pF, Cer, 500 V, 10%
C417	281-0123-00			5-25 pF, Var, Cer, 100 V
C418	281-0122-00			2.5-9 pF, Var, Cer, 100 V
C421	281-0630-00	300500	301299	390 pF, Cer, 500 V, 5%
C421	283-0231-00	301300		470 pF, Cer, 500 V, 10%
C427	281-0123-00			5-25 pF, Var, Cer, 100 V
C428	281-0122-00			2.5-9 pF, Var, Cer, 100 V
C430	283-0224-00			5 pF, Ver, 50 V, +/-0.5 pF
C444	283-0230-00			470 pF, Cer, 500 V, 20%
C446	283-0230-00			470 pF, Cer, 500 V, 20%
C449	283-0237-00			0.1 $\mu$ F, Cer, 25 V, +80%-20%
C452	283-0237-00			0.1 $\mu$ F, Cer, 25 V, +80%-20%
C454	283-0237-00			0.1 $\mu$ F, Cer, 25 V, +80%-20%
C457	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C458	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C460	283-0329-00			0.39 pF, Cer, 500 V, +80%-20%
C462	283-0235-00			0.05 $\mu$ F, Cer, 50 V, +100%-0%
C464	283-0068-00			0.01 $\mu$ F, Cer, 500 V, +100%-0%
C470	283-0329-00			0.39 pF, Cer, 500 V, 10%
C472	283-0235-00			0.05 $\mu$ F, Cer, 50 V, +100%-0%
C474	283-0068-00			0.01 $\mu$ F, Cer, 500 V, +100%-0%
C476	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C478	283-0059-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C480	290-0271-00			9 $\mu$ F, Elect., 125 V, +20%-15%
C508	281-0541-00	300500	301299	6.8 pF, Cer, 500 V, 10%
C508	281-0600-00	301300		35 pF, Cer, 500 V, 10%
C510	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C538	281-0060-01			2-8 pF, Var, Cer
C539	283-0602-01			53 pF, Mica, 300 V, 5%
C540	283-0068-00			0.01 $\mu$ F, Cer, 500 V, +100%-0%
C542	283-0104-01			0.002 $\mu$ F, Cer, 500 V, 5%
C548	290-0136-01			2.2 $\mu$ F, Elect., 20 V, 20%
C549	283-0067-00			0.001 $\mu$ F, Cer, 200 V, 10%
C555	283-0247-00			680 pF, Cer, 500 V, 10%
C558	283-0024-00			0.1 $\mu$ F, Cer, 30 V, +80%-20%
C564	290-0136-01			2.2 $\mu$ F, Elect., 20 V, 20%
C565A	290-0460-00			10 $\mu$ F, Elect., 25 V, 20%
C565B	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C565C	290-0450-00			0.1 $\mu$ F, Elect., 35 V, 20%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff Disc	Description
CAPACITORS (cont)			
C566	283-0228-00		51 pF, Cer, 50 V, 10%
C572	283-0228-00		51 pF, Cer, 50 V, 10%
C590	290-0457-00		4.7 $\mu$ F, Elect., 10 V, 20%
C595	290-0457-00		4.7 $\mu$ F, Elect., 10 V, 20%
C611	281-0650-00		18 pF, Cer, 200 V, 10%
C615	283-0231-00		470 pF, Cer, 500 V, 10%
C616	283-0236-00		0.01 $\mu$ F, Cer, 50 V, 20%
C620A <sup>1</sup>	295-0134-00		1 $\mu$ F,
C620B			0.1 $\mu$ F, Timing capacitor
C620C			0.01 $\mu$ F,
C620D			0.001 $\mu$ F,
C620E	283-0720-00		275 pF, Mica, 500 V, 1%
C620F	281-0123-00		5-25 pF, Var, Cer, 100 V
C626	281-0523-00		100 pF, Cer, 350 V, 10%
C628	281-0503-00		8 pF, Cer, 500 V, $\pm 0.5$ pF
C630	281-0622-00		47 pF, Cer, 500 V, 1%
C636	283-0231-00		470 pF, Cer, 500 V, 10%
C642	290-0136-01		2.2 $\mu$ F, Elect., 20 V, 20%
C644	283-0236-00		0.01 $\mu$ F, Cer, 50 V, 20%
C648	290-0136-01		2.2 $\mu$ F, Elect., 20 V, 20%
C650	281-0550-00		120 pF, Cer, 500 V, 10%
C655	290-0134-02		22 $\mu$ F, Elect., 15 V, +20%-0%
C660A	290-0167-01		10 $\mu$ F, Elect., 15 V
C660B	283-0203-00		0.47 $\mu$ F, Cer, 50 V, 20%
C661	283-0232-00		0.005 $\mu$ F, Cer, 50 V, 20%
C663	281-0523-00		100 pF, Cer, 350 V, 10%
C671	283-0675-01		82 pF, Mica, 300 V, 1%
C672	290-0136-01		2.2 $\mu$ F, Elect., 20 V, 20%
C679	283-0079-02		0.01 $\mu$ F, Cer, 250 V, 20%
C684	283-0231-00		470 pF, Cer, 500 V, 10%
C686	283-0236-00		0.01 $\mu$ F, Cer, 50 V, 20%
C687	283-0230-00		470 pF, Cer, 500 V, 20%
C688	283-0068-00		0.01 $\mu$ F, Cer, 500 V, +80%-20%
C694	283-0068-00		0.01 $\mu$ F, Cer, 500 V, +100%-0%
C695	290-0457-00		4.7 $\mu$ F, Elect., 10 V, 20%

<sup>1</sup>Individual timing capacitors in this assembly must be ordered by the 9 digit part number, letter suffix and tolerance printed on the timing capacitor to be replaced.

Example:

\_\_\_\_\_ | 285-XXXX-XX F- | \_\_\_\_\_

The letter suffix and the tolerance should be the same for all of the timing capacitors in the assembly.

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
CAPACITORS (cont)				
C696	290-0457-00			4.7 $\mu$ F, Elect., 10 V, 20%
C701	281-0123-00	300000	300655	5-25 pF, Var, Cer, 100 V
C701	281-0158-00	300656		7-45 pF, Var, Cer
C702	281-0523-00			100 pF, Cer, 350 V, 10%
C705	283-0231-00	300500	300505	470 pF, Cer, 500 V, 10%
C705	283-0336-00	300506		330 pF, Cer, 500 V, 10%
C722	281-0103-00	300500	300505	180 pF, Cer, 500 V, 5%
C722	283-0727-00	300506	300655	330 pF, Mica, 500 V, 5%
C722	283-0103-00	300656		180 pF, Cer, 500 V, 5%
C736	283-0230-00			470 pF, Cer, 500 V, 20%
C750	283-0241-00	300500	300505	0.2 pF, Cer, 500 V, 20%
C750	283-0329-00	300506		0.39 pF, Cer, 500 V, 10%
C754	283-0233-00			0.0022 $\mu$ F, Cer, 500 V, 20%
C760	290-0449-00			3 $\mu$ F, Elect., 250 V, +100%-0%
C762	283-0231-00			470 pF, Cer, 500 V, 10%
C763	281-0622-00			47 pF, Cer, 500 V, 1%
C764	283-0079-02			0.01 $\mu$ F, Cer, 250 V, 20%
C782	281-0095-00			0.2-1.5 pF, Var, Teflon
C784	283-0240-00			1 pF, Cer, 500 V, 20%
C791	290-0114-01			47 $\mu$ F, Elect., 6 V
C792	290-0114-01			47 $\mu$ F, Elect., 6 V
C870B	290-0562-00			210 $\mu$ F, Elect., 40 V, +75%-10%
C878	290-0164-00			1 $\mu$ F, Elect., 150 V
C887	283-0203-00			0.47 $\mu$ F, Cer, 50 V, 20%
C892	283-0231-00			470 pF, Cer, 500 V, 10%
C894	283-0597-01			470 pF, Mica, 300 V, 10%
C896	283-0597-01			470 pF, Mica, 300 V, 10%
C898	290-0136-01			2.2 $\mu$ F, Elect., 20 V, 20%
C905	283-0000-01			0.001 $\mu$ F, Cer, 500 V, +100%-0%
C910	283-0111-00			0.1 $\mu$ F, Cer, 50 V
C958	290-0167-01			10 $\mu$ F, Elect., 15 V
C959	290-0565-00			150 $\mu$ F, Elect., 6.3 V, 10%
C962	290-0167-01			10 $\mu$ F, Elect., 15 V
C964	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C966	290-0183-01			1 $\mu$ F, Elect., 35 V, 10%
C990	290-0449-00			3 $\mu$ F, Elect., 250 V, +100%-0%
C992	290-0563-00			18 $\mu$ F, Elect., +50%-10%
C994	290-0463-00			47 $\mu$ F, Elect., 20 V, 20%
C1000	290-0643-00			470 $\mu$ F, Elect., 10 V, 20%
C1008	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C1014	290-0134-01			22 $\mu$ F, Elect., 15 V, 20%
C1016	290-0643-00			470 $\mu$ F, Elect., 10 V, 20%
C1022	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C1026	283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C1032	290-0134-01			22 $\mu$ F, Elect., 15 V, 20%
C1040	(7) 283-0151-00			0.01 $\mu$ F, Cer, 500 V
C1041	(7) 283-0151-00			0.01 $\mu$ F, Cer, 500 V
C1042	(7) 283-0151-00			0.01 $\mu$ F, Cer, 500 V



## Electrical Parts List-326 (SN 300500-up)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model Eff	No. Disc	Description
CAPACITORS (cont)					
C1046		283-0293-00			0.05 $\mu$ F, Cer, 1000 V, +100%-0%
C1048		283-0293-00			0.05 $\mu$ F, Cer, 1000 V, +100%-0%
C1050		283-0068-00			0.01 $\mu$ F, Cer, 500 V, +100%-0%
C1052		283-0292-00	300500	300505	0.04 $\mu$ F, Cer, 2000 V, +100%-0%
C1052A		283-0105-00	300506		0.01 $\mu$ F, Cer, 2000 V, +100%-0%
C1052B		283-0105-00	300506		0.01 $\mu$ F, Cer, 2000 V, +100%-0%
C1055		283-0177-00			1 $\mu$ F, Cer, 25 V, +80%-20%
C1062		283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C1068		283-0003-00			0.01 $\mu$ F, Cer, 150 V, +80%-20%
C1105		290-0287-00			47 $\mu$ F, Elect., 25 V, 20%
C1123		283-0110-00			0.005 $\mu$ F, Cer, 150V
C1136		290-0114-01			47 $\mu$ F, Elect., 6 V
DIODES					
CR11		152-0327-00			50 V, 75 mA, BAX 13
CR12		152-0327-00			50 V, 75 mA, BAX 13
CR13		152-0327-00			50 V, 75 mA, BAX 13
CR30		152-0246-00			Silicon, CD12676 or FD3375
CR31		152-0246-00			Silicon, CD12676 or FD3375
CR32		152-0246-00			Silicon, CD12676 or FD3375
CR33		152-0246-00			Silicon, CD12676 or FD3375
CR50A		152-0327-00			50 V, 75 mA, BAX 13
CR50B		152-0327-00			50 V, 75 mA, BAX 13
CR74		152-0327-00			50 V, 75 mA, BAX 13
CR75		152-0327-00			50 V, 75 mA, BAX 13
CR76		152-0327-00			50 V, 75 mA, BAX 13
CR77		152-0327-00			50 V, 75 mA, BAX 13
CR79		152-0327-00			50 V, 75 mA, BAX 13
CR80		152-0071-00			Germanium, ED-2007
CR81		152-0071-00			Germanium, ED-2007
CR82		152-0327-00			50 V, 75 mA, BAX 13
CR83		152-0071-00			Germanium, ED-2007
CR84		152-0071-00			Germanium, ED-2007
CR86		152-0327-00			50 V, 75 mA, BAX 13
CR230		152-0246-00			Silicon, CD12676 or FD3375
CR231		152-0246-00			Silicon, CD12676 or FD3375
CR232		152-0246-00			Silicon, CD12676 or FD3375
CR233		152-0246-00			Silicon, CD12676 or FD3375
CR250A		152-0327-00			50 V, 75 mA, BAX 13
CR250B		152-0327-00			50 V, 75 mA, BAX 13
CR274		152-0327-00			50 V, 75 mA, BAX 13
CR275		152-0327-00			50 V, 75 mA, BAX 13
CR276		152-0327-00			50 V, 75 mA, BAX 13
CR277		152-0327-00			50 V, 75 mA, BAX 13

## ELECTRICAL PARTS LIST (conts)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
	CR279	152-0327-00		50 V, 75 mA, BAX 13
	CR280	152-0071-00		Germanium, ED-2007
	CR281	152-0071-00		Germanium, ED-2007
	CR282	152-0327-00		50 V, 75 mA, BAX 13
	CR283	152-0071-00		Germanium, ED-2007
	CR284	152-0071-00		Germanium, ED-2007
	CR286	152-0327-00		50 V, 75 mA, BAX 13
	CR310	152-0141-02	300500	Silicon, 1N4152
	CR310	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR311	152-0141-02	300500	Silicon, 1N4152
	CR311	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR312	152-0141-02	300500	Silicon, 1N4152
	CR312	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR313	152-0141-02	300500	Silicon, 1N4152
	CR313	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR315	152-0141-02	300500	Silicon, 1N4152
	CR315	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR316	152-0141-02	300500	Silicon, 1N4152
	CR316	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR317	152-0141-02	300500	Silicon, 1N4152
	CR317	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR318	152-0141-02	300500	Silicon, 1N4152
	CR318	152-0327-00	300656	50 V, 75 mA, BAX 13
	CR331	152-0327-00		50 V, 75 mA, BAX 13
	CR335	152-0327-00		50 V, 75 mA, BAX 13
	CR341	152-0327-00		50 V, 75 mA, BAX 13
	CR345	152-0327-00		50 V, 75 mA, BAX 13
	CR400A	152-0327-00		50 V, 75 mA, BAX 13
	CR400B	152-0327-00		50 V, 75 mA, BAX 13
	CR400C	152-0327-00		50 V, 75 mA, BAX 13
	CR440	152-0327-00		50 V, 75 mA, BAX 13
	CR442	152-0327-00		50 V, 75 mA, BAX 13
	CR542	152-0246-00		Silicon, CD12676 or FD3375
	CR543	152-0246-00		Silicon, CD12676 or FD3375
	CR611	152-0327-00		50 V, 75 mA, BAX 13
	CR612	152-0327-00		50 V, 75 mA, BAX 13
	CR613	152-0327-00		50 V, 75 mA, BAX 13
	CR614	152-0327-00		50 V, 75 mA, BAX 13
	CR616	152-0327-00		50 V, 75 mA, BAX 13
	CR620	152-0249-00		Silicon, CD61165 and CD12676
	CR626	152-0327-00		50 V, 75 mA, BAX 13
	CR628	152-0327-00		50 V, 75 mA, BAX 13
	CR636A	152-0327-00		50 V, 75 mA, BAX 13
	CR636B	152-0327-00		50 V, 75 mA, BAX 13
	CR640	152-0327-00		50 V, 75 mA, BAX 13
	CR663	152-0327-00		50 V, 75 mA, BAX 13
	CR667	152-0327-00		50 V, 75 mA, BAX 13
	CR668	152-0327-00		50 V, 75 mA, BAX 13

## ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model Eff	No. Disc	Description
DIODES (cont)					
CR670		152-0327-00			50 V, 75 mA, BAX 13
CR672		152-0327-00			50 V, 75 mA, BAX 13
CR728		152-0327-00			50 V, 75 mA, BAX 13
CR738		152-0327-00			50 V, 75 mA, BAX 13
CR741		152-0327-00			50 V, 75 mA, BAX 13
CR870		152-0107-00			Silicon, T160 or 1N647
CR880		152-0516-00	300500	300851	Silicon, 1N5297
CR880		152-0460-00	300852		Silicon, 1N5297
CR881		152-0327-00			50 V, 75 mA, BAX 13
CR886A		152-0327-00			50 V, 75 mA, BAX 13
CR886B		152-0327-00			50 V, 75 mA, BAX 13
CR886C		152-0327-00			50 V, 75 mA, BAX 13
CR886D		152-0327-00	X301300		50 V, 75 mA, BAX 13
CR890		152-0327-00			50 V, 75 mA, BAX 13
CR892		152-0327-00			50 V, 75 mA, BAX 13
CR894		152-0327-00			50 V, 75 mA, BAX 13
CR896		152-0327-00			50 V, 75 mA, BAX 13
CR922		152-0327-00			50 V, 75 mA, BAX 13
CR929		152-0333-00			Silicon, FDH6012
CR930		152-0327-00			50 V, 75 mA, BAX 13
CR931		152-0333-00			Silicon, FDH6012
CR932		152-0327-00			50 V, 75 mA, BAX 13
CR933		152-0327-00			50 V, 75 mA, BAX 13
CR934		152-0327-00			50 V, 75 mA, BAX 13
CR940		152-0061-00			Silicon, CD8393 or FDH2161
CR948		152-0327-00			50 V, 75 mA, BAX 13
CR958		152-0327-00			50 V, 75 mA, BAX 13
CR959		152-0522-00			Silicon, 1S1305
CR960		152-0552-00			Silicon, 1S1305
CR962		152-0327-00			50 V, 75 mA, BAX 13
CR964		152-0327-00			50 V, 75 mA, BAX 13
CR966		152-0185-00			Silicon, similar to 1N4152
CR972		152-0327-00			50 V, 75 mA, BAX 13
CR976		152-0061-00			Silicon, CD8393 or FDH2161
CR990		152-0242-00			Silicon, 1N486A or CD12691
CR992		152-0061-00			Silicon, CD8393 or FDG2161
CR994		152-0333-00			Silicon, FDH6012
CR995		152-0516-00	300500	300851	Silicon, 1N5297
CR995		152-0460-00	300851		Silicon, 1N5297
CR1000		152-0522-00			Silicon 1S1305
CR1004		152-0327-00			50 V, 75 mA, BAX 13
CR1015		152-0522-00			Silicon, 1S1305
CR1026		152-0327-00			50 V, 75 mA, BAX 13
CR1040A-G		152-0331-00			Rectifier, 1.5 kV, 25 mA, fast recovery
CR1105		152-0107-00			Silicon, T160 or 1N647
CR1110A,B,C,D		152-0447-00			Silicon, 10D2
CR1137		152-0008-00			Germanium, T12G
CR1138		152-0008-00			Germanium, T12G
DELAY LINE					
DL415		119-0381-00			Delay line assembly
BULB					
DS878		150-0084-00			Neon, 2 AA

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
<b>FUSES</b>				
F870	159-0098-00			1.6 A, fast-blo
F1101	159-0097-00			0.4 A, fast-blo
F1101	159-0100-00			0.2 A, fast-blo
<b>INDUCTORS</b>				
L416	276-0543-00	300500	301299	Core, ferrite
L416	276-0543-02	301300		Core, ferrite, insulated
L426	276-0543-00	305000	301299	Core, ferrite
L426	276-0543-02	301300		Core, ferrite, insulated
L457	276-0543-00	300500	301299	Core, ferrite
L457	276-0543-02	301300		Core, ferrite, insulated
L480	108-0587-00			5.6 mH
L612	108-0692-00			270 $\mu$ H
L860	108-0488-00			150 $\mu$ H
L870	108-0464-00			125 $\mu$ H
L943	108-0694-00			19 $\mu$ H
L990	108-0587-00			5.6 mH
L994	108-0692-00			270 $\mu$ H
L1014	108-0463-00			35 $\mu$ H
L1032	108-0463-00			35 $\mu$ H
L1055A	276-0638-00			Core, ferrite
L1055B	276-0638-00			Core, ferrite
L1060	108-0671-00			Trace rotation
<b>TRANSISTORS</b>				
Q1	151-0190-02			Silicon, NPN, 2N3904
Q9	151-0190-02			Silicon, NPN, 2N3904
Q31A,B	151-1010-00			Silicon, FET, SU2115 or D/2N3822, dual
Q41A,B	151-0232-00			Silicon, NPN, 2N2919, dual
Q51	151-0221-02			Silicon, PNP, 2N4258
Q52	151-0221-02			Silicon, PNP, 2N4258
Q53	151-0190-02			Silicon, NPN, 2N3904
Q55	151-0221-02			Silicon, PNP, 2N4258
Q57	151-0221-02			Silicon, PNP, 2N4258
Q59	151-0190-02			Silicon, NPN, 2N3904
Q61	151-0190-02			Silicon, NPN, 2N3904
Q71	151-0190-02			Silicon, NPN, 2N3904
Q81	151-0221-02			Silicon, PNP, 2N4258
Q89	151-0221-02			Silicon, PNP, 2N4258
Q91	151-0190-02			Silicon, NPN, 2N3904
Q95	151-0190-02			Silicon, NPN, 2N3904
Q98	151-0190-02			Silicon, NPN, 2N3904
Q99	151-0190-02			Silicon, NPN, 2N3904
Q231A,B	151-1010-00			Silicon, FET, SU-2115 or D/2N3822, dual
Q241A,B	151-0232-00			Silicon, NPN, 2N2919, dual
Q251	151-0221-02			Silicon, PNP, 2N4258
Q252	151-0221-02			Silicon, PNP, 2N4258
Q253	151-0190-02			Silicon, NPN, 2N3904
Q255	151-0221-02			Silicon, PNP, 2N4258
Q257	151-0221-02			Silicon, PNP, 2N4258
Q259	151-0190-02			Silicon, NPN, 2N3904
Q261	151-0190-02			Silicon, NPN, 2N3904
Q271	151-0190-02			Silicon, NPN, 2N3904
Q281	151-0221-02			Silicon, PNP, 2N4258
Q289	151-0221-02			Silicon, PNP, 2N4258

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q291	151-0190-02			Silicon, NPN, 2N3904
Q299	151-0190-02			Silicon, NPN, 2N3904
Q333	151-0220-00			Silicon, PNP, 2N4122
Q343	151-0220-00			Silicon, PNP, 2N4122
Q351	151-0190-02			Silicon, NPN, 2N3904
Q355	151-0220-00			Silicon, PNP, 2N4122
Q361	151-0190-02			Silicon, NPN, 2N3904
Q376	151-0220-00			Silicon, PNP, 2N4122
Q386	151-0220-00			Silicon, PNP, 2N4122
Q392	151-0190-02			Silicon, NPN, 2N3904
Q410	151-0190-02			Silicon, NPN, 2N3904
Q415	151-0216-00	300500	301299	Silicon, PNP, MPS6523
Q415	151-0220-00	301300		Silicon, PNP, 2N4122
Q416	151-0367-00			Silicon, NPN, SKA6516
Q420	151-0190-02			Silicon, NPN, 2N3904
Q425	151-0216-00	300500	301299	Silicon, PNP, MPS6523
Q425	151-0220-00	301300		Silicon, PNP, 2N4122
Q426	151-0367-00			Silicon, NPN, SKA6516
Q432	151-0375-00			Silicon, NPN, 2SC403C
Q434	151-0375-00			Silicon, NPN, 2SC403C
Q448	151-0375-00			Silicon, NPN, 2SC403C
Q452	151-0219-00			Silicon, PNP, 2N4250
Q454	151-0376-00			Silicon, NPN, 2SC402C
Q457	151-0234-00	300500	301784	Silicon, NPN, 2SC805
Q457	151-0489-00	301785		Silicon, NPN, 2SC1630
Q458	151-0234-00	300500	301784	Silicon, NPN, 2SC805
Q458	151-0489-00	301785		Silicon, NPN, 2SC1630
Q462	151-0234-00	300500	301784	Silicon, NPN, 2SC805
Q462	151-0489-00	301785		Silicon, NPN, 2SC1630
Q464	151-0214-00			Silicon, PNP, 2N3495
Q472	151-0234-00	300500	301784	Silicon, PNP, 2SC805
Q472	151-0489-00	301785		Silicon, NPN, 2SC1630
Q474	151-0214-00			Silicon, PNP, 2N3495
Q505	151-0220-00			Silicon, PNP, 2N4122
Q510	151-0190-02			Silicon, NPN, 2N3904
Q545	151-1018-00			Silicon, FET, N channel, 2SK-12R
Q552	151-0376-00			Silicon, NPN, 2SC-402C
Q556	151-0376-00			Silicon, NPN, 2SC-402C
Q570	153-0605-00			Silicon, NPN, SKA6516, checked
Q580	151-0367-00			Silicon, NPN, SKA6516
Q611	151-0190-02			Silicon, NPN, 2N3904
Q615	151-0190-02			Silicon, NPN, 2N3904
Q630	151-0367-00			Silicon, NPN, SKA6516
Q636	151-0367-00			Silicon, NPN, SKA6516
Q638	151-0367-00			Silicon, NPN, SKA6516
Q640	151-1018-00			Silicon, FET, N channel, 2SK-12R
Q652	151-0376-00			Silicon, NPN, 2SC-402C
Q655	151-0220-00			Silicon, PNP, 2N4122
Q658	151-0190-02			Silicon, NPN, 2N3904
Q661	151-0190-02			Silicon, NPN, 2N3904
Q664	151-0190-02			Silicon, NPN, 2N3904
Q672	151-0220-00			Silicon, PNP, 2N4122
Q682	151-0234-00	300500	301784	Silicon, NPN, 2SC805
Q682	151-0489-00	301785		Silicon, NPN, 2SC1630
Q690	151-0234-00	300500	301784	Silicon, NPN, 2SC805
Q690	151-0489-00	301785		Silicon, NPN, 2SC1630
Q692	151-0214-00			Silicon, PNP, 2N3495

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q726	151-0220-00			Silicon, PNP, 2N4122
Q732	151-0190-02			Silicon, NPN, 2N3904
Q738	151-0220-00			Silicon, PNP, 2N4122
Q740	151-0220-00			Silicon, PNP, 2N4122
Q741	151-0190-02			Silicon, NPN, 2N3904
Q744	151-0376-00			Silicon, NPN, 2SC-402C
Q746	151-0376-00			Silicon, NPN, 2SC-402C
Q748	151-0403-00			Silicon, NPN, 2SC1012A
Q756	151-0220-00			Silicon, PNP, 2N4122
Q758	151-0228-00			Silicon, PNP, selected from 2N4888
Q770	151-0220-00			Silicon, PNP, 2N4122
Q772	151-0228-00			Silicon, PNP, selected from 2N4888
Q786	151-0220-00			Silicon, PNP, 2N4122
Q788	151-0403-00			Silicon, NPN, 2SC1012A
Q878	151-0179-00			Silicon, NPN, 2N3877A
Q882	151-0306-00			Silicon, NPN, 2SC756
Q884	151-0306-00			Silicon, NPN, 2SC756
Q887	151-0190-02			Silicon, NPN, 2N3904
Q888	151-0190-02			Silicon, NPN, 2N3904
Q890	151-0190-02			Silicon, NPN, 2N3904
Q892	151-0190-02			Silicon, NPN, 2N3904
Q917	151-0220-00			Silicon, PNP, 2N4122
Q918	151-0306-00			Silicon, NPN, 2SC756
Q928	151-0306-00			Silicon, NPN, 2SC756
Q930	151-0306-00			Silicon, NPN, 2SC756
Q942	151-0516-00			Silicon, unijunction, D13T1
Q948	151-0306-00			Silicon, NPN, 2SC756
Q976	151-0231-00	300500	301045	Silicon, NPN, 2SC756-3
Q976	151-0231-01	301046	301462	Silicon, NPN, 2SC756-3, selected
Q976	151-0231-00	301463		Silicon, NPN, 2SC756
Q978	151-0231-00	300500	301045	Silicon, NPN, 2SC756
Q978	151-0231-01	301046	301462	Silicon, NPN, 2SC746-3, selected
Q978	151-0231-00	301463		Silicon, NPN, 2SC756
Q1008	151-0190-02			Silicon, NPN, 2N3904
Q1010	151-0190-02			Silicon, NPN, 2N3904
Q1012	151-0164-00			Silicon, PNP, 2N5447 or 2N3702
Q1018	151-0220-00			Silicon, PNP, 2N4122
Q1022	151-0190-02			Silicon, NPN, 2N3904
Q1024	151-0207-00			Silicon, NPN, 2N3415
Q1117	151-0374-00			Silicon, NPN, 2SD316
Q1120	151-0219-00			Silicon, PNP, 2N4250
Q1121	151-0224-00			Silicon, NPN, 2N3692
Q1134	151-0219-00			Silicon, NPN, 2N4250
Q1136	151-0219-00			Silicon, PNP, 2N4250
RESISTORS				
R1	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R2	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R3	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R4	315-0752-01			7.5 k $\Omega$ , 1/4 W, 5%
R6	315-0331-01			330 $\Omega$ , 1/4 W, 5%
R8	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R9	315-0822-01			8.2 k $\Omega$ , 1/4 W, 5%
R12	321-0316-30			19.1 k $\Omega$ , 1/8 W, 1%
R13	321-0318-30			20 k $\Omega$ , 1/8 W, 1%
R15	321-0336-30			30.9 k $\Omega$ , 1/8 W, 1%
R17	321-0753-31			9 k $\Omega$ , 1/8 W, 1/2%
R18	321-0754-31			900 $\Omega$ , 1/8 W, 1/2%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
RESISTORS (cont)				
R19	321-0636-00			100 $\Omega$ , 1/8 W, 1/2%
R20	315-0474-01			470 k $\Omega$ , 1/4 W, 5%
R21	315-0470-02			47 $\Omega$ , 1/4 W, 5%
R23B	322-0621-31			900 k $\Omega$ , 1/4 W, 1/2%
R23C	321-1389-31			111 k $\Omega$ , 1/8 W, 1/2%
R24B	322-0624-01			990 k $\Omega$ , 1/4 W, 1/2%
R24C	321-1289-31			10.1 k $\Omega$ , 1/8 W, 1/2%
R25B	322-0625-01			995 k $\Omega$ , 1/4 W, 1/2%
R25C	321-0613-31			5.03 k $\Omega$ , 1/8 W, 1/2%
R27B	322-0610-31			500 k $\Omega$ , 1/4 W, 1/2%
R27C	322-0481-01			1 M $\Omega$ , 1/4 W, 1/2%
R27D	315-0333-01			33 k $\Omega$ , 1/4 W, 5%
R28B	322-0620-31			800 k $\Omega$ , 1/4 W, 1/2%
R28C	321-0618-31			250 k $\Omega$ , 1/8 W, 1/2%
R29	322-0481-01			1 M $\Omega$ , 1/4 W, 1/2%
R30	321-0385-31			100 k $\Omega$ , 1/8 W, 1/2%
R31	315-0201-01			200 $\Omega$ , 1/4 W, 5%
R32	321-0068-30			49.9 $\Omega$ , 1/8 W, 1%
R33	321-0249-30			3.83 k $\Omega$ , 1/8 W, 1%
R35	321-0249-30			3.83 k $\Omega$ , 1/8 W, 1%
R36	311-0622-00			100 $\Omega$ , Var
R37	311-0634-00			500 $\Omega$ , Var
R38	321-0213-30			1.62 k $\Omega$ , 1/8 W, 1%
R40	321-0210-30			1.5 k $\Omega$ , 1/8 W, 1%
R41	311-0643-00			50 $\Omega$ , Var
R42	321-0103-30			115 $\Omega$ , 1/8 W, 1%
R44	321-0213-30			1.62 k $\Omega$ , 1/8 W, 1%
R46	321-0265-30			5.62 k $\Omega$ , 1/8 W, 1%
R47	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R48	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R50	321-0217-30			1.78 k $\Omega$ , 1/8 W, 1%
R51	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R52	321-0265-30			5.62 k $\Omega$ , 1/8 W, 1%
R53	321-0181-30			750 $\Omega$ , 1/8 W, 1%
R54	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R55	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R57	321-0277-30			7.5 k $\Omega$ , 1/8 W, 1%
R59	321-0277-30			7.5 k $\Omega$ , 1/8 W, 1%
R60	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R61	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R63	321-0260-30			4.99 k $\Omega$ , 1/8 W, 1%
R64	321-0157-30	300500	301299	422 $\Omega$ , 1/8 W, 1%
R64	321-0161-30	301300		464 $\Omega$ , 1/8 W, 1%
R65	311-0605-00			200 $\Omega$ , Var
R66	311-1329-01			3 k $\Omega$ , Var
R68	321-0231-30			2.49 k $\Omega$ , 1/8 W, 1%
R69	311-0634-00			500 $\Omega$ , Var
R71	321-0231-30			2.49 k $\Omega$ , 1/8 W, 1%
R72	321-0260-30			4.99 k $\Omega$ , 1/8 W, 1%
R74	315-0243-01			24 k $\Omega$ , 1/4 W, 5%
R75	311-0689-01			2 x 10 k $\Omega$ , Var
R76	315-0243-01			24 k $\Omega$ , 1/4 W, 5%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
RESISTORS (cont)				
R77	321-0297-30			12.1 k $\Omega$ , 1/8 W, 1%
R79	321-0297-30			12.1 k $\Omega$ , 1/8 W, 1%
R81	321-0264-30			5.49 k $\Omega$ , 1/8 W, 1%
R82	311-0633-00			5 k $\Omega$ , Var
R84	311-0633-00			5 k $\Omega$ , Var
R85	321-0264-30			5.49 k $\Omega$ , 1/8 W, 1%
R87	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R88	321-0251-30			4.02 k $\Omega$ , 1/8 W, 1%
R90	321-0251-30			4.02 k $\Omega$ , 1/8 W, 1%
R91	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R93	321-0193-30			1 k $\Omega$ , 1/8 W, 1%
R94	315-0471-02			470 $\Omega$ , 1/4 W, 5%
R95	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R96	315-0751-03			750 $\Omega$ , 1/4 W, 5%
R97	315-0391-02			390 $\Omega$ , 1/4 W, 5%
R98	315-0203-01			20 k $\Omega$ , 1/4 W, 5%
R99	315-0221-01			220 $\Omega$ , 1/4 W, 5%
R100	321-0193-30			1 k $\Omega$ , 1/8 W, 1%
R102	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R104	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R201	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R202	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R220	315-0474-01			470 k $\Omega$ , 1/4 W, 5%
R221	315-0470-02			47 $\Omega$ , 1/4 W, 5%
R223B	322-0621-31			900 k $\Omega$ , 1/4 W, 1/2%
R223C	321-1389-31			111 k $\Omega$ , 1/8 W, 1/2%
R224B	322-0624-01			990 k $\Omega$ , 1/4 W, 1/2%
R224C	321-1289-31			10.1 k $\Omega$ , 1/8 W, 1/2%
R225B	322-0625-01			995 k $\Omega$ , 1/4 W, 1/2%
R225C	321-0613-31			5.03 k $\Omega$ , 1/8 W, 1/2%
R227B	322-0610-31			500 k $\Omega$ , 1/4 W, 1/2%
R227C	322-0481-01			1 M $\Omega$ , 1/4 W, 1/2%
R227D	315-0333-01			33 k $\Omega$ , 1/4 W, 5%
R228B	322-0620-31			800 k $\Omega$ , 1/4 W, 1/2%
R228C	321-0618-31			250 k $\Omega$ , 1/8 W, 1/2%
R229	322-0481-01			1 M $\Omega$ , 1/4 W, 1/2%
R230	321-0385-31			100 k $\Omega$ , 1/8 W, 1/2%
R231	315-0201-01			200 $\Omega$ , 1/4 W, 5%
R232	321-0068-30			49.9 $\Omega$ , 1/8 W, 1%
R233	321-0249-30			3.83 k $\Omega$ , 1/8 W, 1%
R235	321-0249-30			3.83 k $\Omega$ , 1/8 W, 1%
R236	311-0622-00			100 $\Omega$ , Var
R237	311-0634-00			500 $\Omega$ , Var
R238	321-0213-30			1.62 k $\Omega$ , 1/8 W, 1%
R240	321-0210-30			1.5 k $\Omega$ , 1/8 W, 1%
R241	311-0643-00			50 $\Omega$ , Var
R242	321-0103-30			115 $\Omega$ , 1/8 W, 1%
R244	321-0213-30			1.62 k $\Omega$ , 1/8 W, 1%
R246	321-0265-30			5.62 k $\Omega$ , 1/8 W, 1%
R247	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R248	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%



## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
RESISTORS (cont)				
R250	321-0217-30			1.78 k $\Omega$ , 1/8 W, 1%
R251	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R252	321-0265-30			5.62 k $\Omega$ , 1/8 W, 1%
R253	321-0181-30			750 $\Omega$ , 1/8 W, 1%
R254	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R255	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R257	321-0277-30			7.5 k $\Omega$ , 1/8 W, 1%
R259	321-0277-30			7.5 k $\Omega$ , 1/8 W, 1%
R260	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R261	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R263	321-0260-30			4.99 k $\Omega$ , 1/8 W, 1%
R264	321-0157-30	300500	301299	422 $\Omega$ , 1/8 W, 1%
R264	321-0161-30	301300		464 $\Omega$ , 1/8 W, 1%
R265	311-0605-00			200 $\Omega$ , Var
R266	311-1329-01			3 k $\Omega$ , Var
R268	321-0231-30			2.49 k $\Omega$ , 1/8 W, 1%
R269	311-0634-00			500 $\Omega$ , Var
R271	321-0231-30			2.49 k $\Omega$ , 1/8 W, 1%
R272	321-0260-30			4.99 k $\Omega$ , 1/8 W, 1%
R274	315-0243-01			24 k $\Omega$ , 1/4 W, 5%
R275	311-0689-01			2 x 10 k $\Omega$ , Var
R276	315-0243-01			24 k $\Omega$ , 1/4 W, 5%
R277	321-0297-30			12.1 k $\Omega$ , 1/8 W, 1%
R279	321-0297-30			12.1 k $\Omega$ , 1/8 W, 1%
R281	321-0264-30			5.49 k $\Omega$ , 1/8 W, 1%
R282	311-0633-00			5 k $\Omega$ , Var
R284	311-0633-00			5 k $\Omega$ , Var
R285	321-0264-30			5.49 k $\Omega$ , 1/8 W, 1%
R287	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R288	321-0251-30			4.02 k $\Omega$ , 1/8 W, 1%
R290	321-0251-30			4.02 k $\Omega$ , 1/8 W, 1%
R291	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R293	321-0193-30			1 k $\Omega$ , 1/8 W, 1%
R300	321-0193-30			1 k $\Omega$ , 1/8 W, 1%
R302	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R304	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R330	315-0152-01			1.5 k $\Omega$ , 1/4 W, 5%
R331	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R332	315-0222-02			2.2 k $\Omega$ , 1/4 W, 5%
R333	315-0222-02			2.2 k $\Omega$ , 1/4 W, 5%
R334	315-0391-02			390 $\Omega$ , 1/4 W, 5%
R335	315-0511-01			510 $\Omega$ , 1/4 W, 5%
R340	315-0152-01			1.5 k $\Omega$ , 1/4 W, 5%
R341	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R342	315-0222-02			2.2 k $\Omega$ , 1/4 W, 5%
R343	315-0222-02			2.2 k $\Omega$ , 1/4 W, 5%
R344	315-0391-02			390 $\Omega$ , 1/4 W, 5%
R345	315-0511-01			510 $\Omega$ , 1/4 W, 5%
R350	315-0201-01			200 $\Omega$ , 1/4 W, 5%
R351	315-0222-02			2.2 k $\Omega$ , 1/4 W, 5%
R352	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R355	315-0101-01			100 $\Omega$ , 1/4 W, 5%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R360	315-0104-02			100 k $\Omega$ , 1/4 W, 5%
R361	315-0122-01			1.2 k $\Omega$ , 1/4 W, 5%
R362	315-0471-02			470 $\Omega$ , 1/4 W, 5%
R363	315-0473-01			47 k $\Omega$ , 1/4 W, 5%
R370	321-0232-30			2.55 k $\Omega$ , 1/8 W, 1%
R375	321-0213-30			1.62 k $\Omega$ , 1/8 W, 1%
R376	315-0361-02			360 $\Omega$ , 1/4 W, 5%
R377	321-0099-30			105 $\Omega$ , 1/8 W, 1%
R380	321-0232-30			2.55 k $\Omega$ , 1/8 W, 1%
R385	321-0213-30			1.62 k $\Omega$ , 1/8 W, 1%
R386	315-0361-02			360 $\Omega$ , 1/4 W, 5%
R388	321-0099-30			105 $\Omega$ , 1/8 W, 1%
R390	315-0182-02			1.8 k $\Omega$ , 1/4 W, 5%
R391	315-0621-01			620 $\Omega$ , 1/4 W, 5%
R392	315-0512-01			5.1 k $\Omega$ , 1/4 W, 5%
R395	315-0471-02			470 $\Omega$ , 1/4 W, 5%
R397	321-0167-30			536 $\Omega$ , 1/8 W, 1%
R400	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R402	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R410	321-0097-30			100 $\Omega$ , 1/8 W, 1%
R411	311-0635-00			1 k $\Omega$ , Var
R412	321-0229-30	300500	301299	2.37 k $\Omega$ , 1/8 W, 1%
R412	321-0231-30	301300		2.49 k $\Omega$ , 1/8 W, 1%
R413	312-0334-30			29.4 k $\Omega$ , 1/8 W, 1%
R414	321-0269-30			6.19 k $\Omega$ , 1/8 W, 1%
R415	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R416A	321-0261-30			5.11 k $\Omega$ , 1/8 W, 1%
R416B	315-0240-01			24 $\Omega$ , 1/4 W, 5%
R416C	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R417	321-0233-30			2.61 k $\Omega$ , 1/8 W, 1%
R418	311-0609-00			2 k $\Omega$ , Var
R419	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R420	321-0097-30			100 $\Omega$ , 1/8 W, 1%
R421	311-0635-00			1 k $\Omega$ , Var
R422	321-0229-30	300500	301299	2.37 k $\Omega$ , 1/8 W, 1%
R422	321-0231-30	301300		2.49 k $\Omega$ , 1/8 W, 1%
R424	321-0269-30			6.19 k $\Omega$ , 1/8 W, 1%
R425	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R426A	321-0261-30			5.11 k $\Omega$ , 1/8 W, 1%
R426B	315-0240-01			24 $\Omega$ , 1/4 W, 5%
R426C	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R427	321-0233-30			2.61 k $\Omega$ , 1/8 W, 1%
R428	311-0609-00			2 k $\Omega$ , Var
R429	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R432	315-0561-02			560 $\Omega$ , 1/4 W, 5%
R434	315-0561-02			560 $\Omega$ , 1/4 W, 5%
R436	321-0253-30			4.22 k $\Omega$ , 1/8 W, 1%
R438	321-0253-30			4.22 k $\Omega$ , 1/8 W, 1%
R440	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R442	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R444	315-0113-01			11 k $\Omega$ , 1/4 W, 5%
R446	315-0202-01			2 k $\Omega$ , 1/4 W, 5%
R448	315-0390-02			39 $\Omega$ , 1/4 W, 5%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R449	315-0392-01			3.9 k $\Omega$ , 1/4 W, 5%
R450	315-0822-01			8.2 k $\Omega$ , 1/4 W, 5%
R452	315-0302-01			3 k $\Omega$ , 1/4 W, 5%
R454	321-0113-30			147 $\Omega$ , 1/8 W, 1%
R456	321-0233-30			2.61 k $\Omega$ , 1/8 W, 1%
R457	321-0113-30			147 $\Omega$ , 1/8 W, 1%
R458	321-0113-30			147 $\Omega$ , 1/8 W, 1%
R459A	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R459B	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R460	321-0401-30			147 k $\Omega$ , 1/8 W, 1%
R462	315-0621-01			620 $\Omega$ , 1/4 W, 5%
R464	315-0562-01			5.6 k $\Omega$ , 1/4 W, 5%
R470	321-0401-30			147 k $\Omega$ , 1/8 W, 1%
R472	315-0621-01			620 $\Omega$ , 1/4 W, 5%
R474	315-0562-01			5.6 k $\Omega$ , 1/4 W, 5%
R476	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R478	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R480	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R502	315-0511-01			510 $\Omega$ , 1/4 W, 5%
R503	315-0511-01			510 $\Omega$ , 1/4 W, 5%
R504A	315-0511-01			510 $\Omega$ , 1/4 W, 5%
R504B	315-0512-01			5.1 k $\Omega$ , 1/4 W, 5%
R505	315-0821-02			820 $\Omega$ , 1/4 W, 5%
R506	315-0202-01	300500	301299	2 k $\Omega$ , 1/4 W, 5%
R506	315-0562-01	301300		5.6 k $\Omega$ , 1/4 W, 5%
R507	315-0202-01			2 k $\Omega$ , 1/4 W, 5%
R508	315-0751-03			750 $\Omega$ , 1/4 W, 5%
R510	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R511	315-0472-01			4.7 k $\Omega$ , 1/4 W, 5%
R535	315-0471-02			470 $\Omega$ , 1/4 W, 5%
R536	322-0621-30			900 k $\Omega$ , 1/4 W, 1%
R538	321-0617-30			111 k $\Omega$ , 1/8 W, 1%
R540	322-0481-00			1 M $\Omega$ , 1/4 W, 1%
R542	315-0104-02			100 k $\Omega$ , 1/4 W, 5%
R545	315-0332-02			3.3 k $\Omega$ , 1/4 W, 5%
R546	311-0644-00			20 k $\Omega$ , Var
R550	315-0472-01			4.7 k $\Omega$ , 1/4 W, 5%
R552	321-0237-30			2.87 k $\Omega$ , 1/8 W, 1%
R553	315-0161-01			160 $\Omega$ , 1/4 W, 5%
R554	321-0229-30			2.37 k $\Omega$ , 1/8 W, 1%
R556	321-0237-00			2.87 k $\Omega$ , 1/8 W, 1%
R557	315-0161-01			160 $\Omega$ , 1/4 W, 5%
R558	315-0472-01			4.7 k $\Omega$ , 1/4 W, 5%
R560	315-0133-01	300500	301299	13 k $\Omega$ , 1/4 W, 5%
R560	315-0472-01	301300		4.7 k $\Omega$ , 1/4 W, 5%
R562	311-0687-00			50 k $\Omega$ , Var
R564	321-0297-30			12.1 k $\Omega$ , 1/8 W, 1%
R566	321-0269-30			6.19 k $\Omega$ , 1/8 W, 1%
R568	321-0333-30			28.7 k $\Omega$ , 1/8 W, 1%
R570	321-0177-30			681 $\Omega$ , 1/8 W, 1%
R572	321-0297-30			12.1 k $\Omega$ , 1/8 W, 1%
R574	321-0257-30			4.64 k $\Omega$ , 1/8 W, 1%
R576	321-0285-30			9.09 k $\Omega$ , 1/8 W, 1%
R578	321-0217-30			1.78 k $\Omega$ , 1/8 W, 1%
R580	321-0193-30			1 k $\Omega$ , 1/8 W, 1%
R582	312-0289-30			10 k $\Omega$ , 1/8 W, 1%
R590	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R595	315-0100-01			10 $\Omega$ , 1/4 W, 5%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff Disc	Description
RESISTORS (cont)			
R611	311-0609-00		2 k $\Omega$ , Var
R611A	315-0103-02		10 k $\Omega$ , 1/4 W, 5%
R611B	315-0222-02		2.2 k $\Omega$ , 1/4 W, 5%
R612	315-0332-02		3.3 k $\Omega$ , 1/4 W, 5%
R613	315-0104-02		100 k $\Omega$ , 1/4 W, 5%
R614	315-0512-01		5.1 k $\Omega$ , 1/4 W, 5%
R615	315-0333-01		33 k $\Omega$ , 1/4 W, 5%
R616	315-0104-02		100 k $\Omega$ , 1/4 W, 5%
R617	321-0277-30		7.5 k $\Omega$ , 1/8 W, 1%
R618	311-0633-00		5 k $\Omega$ , Var
R619	321-0255-30		4.42 k $\Omega$ , 1/8 W, 1%
R620A	309-0095-00		10 M $\Omega$ , 1/2 W, 1%
R620B	309-0087-00		5 M $\Omega$ , 1/2 W, 1%
R620C	322-0481-01		1 M $\Omega$ , 1/4 W, 1/2%
R620D	322-0481-01		1 M $\Omega$ , 1/4 W, 1/2%
R620E	322-0610-31		500 k $\Omega$ , 1/4 W, 1/2%
R620F	321-0414-31		200 k $\Omega$ , 1/8 W, 1/2%
R620G	321-0385-31		100 k $\Omega$ , 1/8 W, 1/2%
R620H	321-0756-31		50 k $\Omega$ , 1/8 W, 1/2%
R622A,B	311-1330-01		50 k $\Omega$ x 20 k $\Omega$ , Var
R624	315-0123-01		12 k $\Omega$ , 1/4 W, 5%
R626	315-0102-01		1 k $\Omega$ , 1/4 W, 5%
R628	321-0251-30		4.02 k $\Omega$ , 1/8 W, 1%
R630	321-0235-30		2.74 k $\Omega$ , 1/8 W, 1%
R632	321-0239-30		3.01 k $\Omega$ , 1/8 W, 1%
R634	321-0263-30		5.36 k $\Omega$ , 1/8 W, 1%
R636	321-0268-30		6.04 k $\Omega$ , 1/8 W, 1%
R637	315-0563-02		56 k $\Omega$ , 1/4 W, 5%
R638	315-0152-01		1.5 k $\Omega$ , 1/4 W, 5%
R639A	315-0332-02		3.3 k $\Omega$ , 1/4 W, 5%
R640	315-0682-01		6.8 k $\Omega$ , 1/4 W, 5%
R642	315-0221-01		220 $\Omega$ , 1/4 W, 5%
R644	315-0153-02		15 k $\Omega$ , 1/4 W, 5%
R646	315-0563-02		56 k $\Omega$ , 1/4 W, 5%
R648	315-0511-01		510 $\Omega$ , 1/4 W, 5%
R650	315-0511-01		510 $\Omega$ , 1/4 W, 5%
R652	315-0222-02		2.2 k $\Omega$ , 1/4 W, 5%
R653	315-0222-02		2.2 k $\Omega$ , 1/4 W, 5%
R655	315-0102-01		1 k $\Omega$ , 1/4 W, 5%
R656	315-0103-02		10 k $\Omega$ , 1/4 W, 5%
R658	315-0332-02		3.3 k $\Omega$ , 1/4 W, 5%
R660	315-0822-01		8.2 k $\Omega$ , 1/4 W, 5%
R661	315-0913-01		91 k $\Omega$ , 1/4 W, 5%
R663	315-0104-02		100 k $\Omega$ , 1/4 W, 5%
R664	315-0333-01		33 k $\Omega$ , 1/4 W, 5%
R665	315-0562-01		5.6 k $\Omega$ , 1/4 W, 5%
R666	315-0203-01		20 k $\Omega$ , 1/4 W, 5%
R667	315-0112-01		1.1 k $\Omega$ , 1/4 W, 5%
R668	315-0103-02		10 k $\Omega$ , 1/4 W, 5%
R669	315-0102-01		1 k $\Omega$ , 1/4 W, 5%
R670	315-0103-02		10 k $\Omega$ , 1/4 W, 5%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R672	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R674	315-0201-01			200 $\Omega$ , 1/4 W, 5%
R676	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R678	315-0752-01			7.5 k $\Omega$ , 1/4 W, 5%
R680	315-0202-01			2 k $\Omega$ , 1/4 W, 5%
R682	315-0473-01			47 k $\Omega$ , 1/4 W, 5%
R684	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R685	315-0202-01			2 k $\Omega$ , 1/4 W, 5%
R686	315-0274-01			270 k $\Omega$ , 1/4 W, 5%
R687	315-0474-01			470 k $\Omega$ , 1/4 W, 5%
R690	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R692	315-0682-01			6.8 k $\Omega$ , 1/4 W, 5%
R694	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R695	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R696	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R701	321-0270-30			6.34 k $\Omega$ , 1/8 W, 1%
R702	311-0607-00			10 k $\Omega$ , Var
R703	321-0306-30			15 k $\Omega$ , 1/8 W, 1%
R704	311-0644-00			20 k $\Omega$ , Var
R705	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R706	311-0633-00			5 k $\Omega$ , Var
R708A,B	311-0691-01			2 x 20 k $\Omega$ , Var
R709	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R710	321-0318-30			20 k $\Omega$ , 1/8 W, 1%
R711	315-0104-02			100 k $\Omega$ , 1/4 W, 5%
R712	321-0356-30	300500	300505	49.9 k $\Omega$ , (nominal value) selected
R712	321-0366-30	300506		63.4 k $\Omega$ , (nominal value) selected
R713	311-0644-00			20 k $\Omega$ , Var
R714	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R715	321-0264-30			5.49 k $\Omega$ , 1/8 W, 1%
R716	321-0309-30			16.2 k $\Omega$ , 1/8 W, 1%
R717	311-0633-00			5 k $\Omega$ , Var
R718	321-0223-00			2.05 k $\Omega$ , 1/8 W, 1%
R722	321-0126-30			200 $\Omega$ , 1/8 W, 1%
R724	321-0223-30			2.05 k $\Omega$ , 1/8 W, 1%
R726	321-0268-30			6.04 k $\Omega$ , 1/8 W, 1%
R728	321-0103-30			115 $\Omega$ , 1/8 W, 1%
R730	315-0512-01			5.1 k $\Omega$ , 1/4 W, 5%
R732	321-0239-30			3.01 k $\Omega$ , 1/8 W, 1%
R734	321-0260-30			4.99 k $\Omega$ , 1/8 W, 1%
R736	321-0260-30			4.99 k $\Omega$ , 1/8 W, 1%
R738	321-0356-30			49.9 k $\Omega$ , 1/8 W, 1%
R740	321-0289-30			10 k $\Omega$ , 1/8 W, 1%
R741	321-0233-30			2.61 k $\Omega$ , 1/8 W, 1%
R742	321-0226-30			2.21 k $\Omega$ , 1/8 W, 1%
R743	321-0231-30			2.49 k $\Omega$ , 1/8 W, 1%
R744	315-0223-02	300500	300505	22 k $\Omega$ , 1/4 W, 5%
R744	321-0322-30	300506		22.1 k $\Omega$ , 1/8 W, 1%
R745	315-0242-02			2.4 k $\Omega$ , 1/4 W, 5%
R746	315-0242-02			2.4 k $\Omega$ , 1/4 W, 5%
R748	315-0332-02			3.3 k $\Omega$ , 1/4 W, 5%
R750	322-0610-31			500 k $\Omega$ , 1/4 W, 1/2%
R752	315-0303-02			30 k $\Omega$ , 1/4 W, 5%

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R754	315-0304-01			300 k $\Omega$ , 1/4 W, 5%
R756	315-0201-01			200 $\Omega$ , 1/4 W, 5%
R758	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R760	315-0474-01			470 k $\Omega$ , 1/4 W, 5%
R762	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R764	315-0203-01			20 k $\Omega$ , 1/4 W, 5%
R766	315-0303-02			30 k $\Omega$ , 1/4 W, 5%
R768	315-0244-01			240 k $\Omega$ , 1/4 W, 5%
R770	315-0201-01			200 $\Omega$ , 1/4 W, 5%
R772	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R775	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R780	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R782	322-0481-00			1 M $\Omega$ , 1/4 W, 1%
R784	322-0481-00			1 M $\Omega$ , 1/4 W, 1%
R786	321-0336-30			30.9 k $\Omega$ , 1/8 W, 1%
R788	315-0153-02			15 k $\Omega$ , 1/4 W, 5%
R791	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R792	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R870	321-0300-30	300500	300605X	13 k $\Omega$ , 1/8 W, 1%
R871	321-0368-30			66.5 k $\Omega$ , 1/8 W, 1%
R872	321-0372-30	300500	300605	73.2 k $\Omega$ , 1/8 W, 1%
R872	321-0380-30	300606		88.7 k $\Omega$ , 1/8 W, 1%
R873	321-0339-30	300500	300605X	33.2 k $\Omega$ , 1/8 W, 1%
R878	315-0105-01			1 M $\Omega$ , 1/4 W, 5%
R880	315-0470-02			47 $\Omega$ , 1/4 W, 5%
R882	315-0470-02			47 $\Omega$ , 1/4 W, 5%
R884	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R887	315-0243-01			24 k $\Omega$ , 1/4 W, 5%
R888 <sup>1</sup>	315-0562-01			5.6 k $\Omega$ , 1/4 W, 5%
R889 <sup>1</sup>				
R890	315-0243-01			24 k $\Omega$ , 1/4 W, 5%
R892	315-0243-01			24 k $\Omega$ , 1/4 W, 5%
R894	315-0204-01			200 k $\Omega$ , 1/4 W, 5%
R896	315-0204-01			200 k $\Omega$ , 1/4 W, 5%
R898	315-0432-01			4.3 k $\Omega$ , 1/4 W, 5%
R905	321-0318-30			20 k $\Omega$ , 1/8 W, 1%
R906	315-0155-01			1.5 M $\Omega$ , 1/4 W, 5%
R907	311-0609-00			2 k $\Omega$ , Var
R909	321-0268-30			6.04 k $\Omega$ , 1/8 W, 1%
R910	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R915	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R917	315-0101-01			100 $\Omega$ , 1/4 W, 5%
R922	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R924	315-0204-01			200 k $\Omega$ , 1/4 W, 5%
R926	315-0682-01			6.8 k $\Omega$ , 1/4 W, 5%
R927	315-0302-01			3 k $\Omega$ , 1/4 W, 5%
R928	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R930	315-0562-01			5.6 k $\Omega$ , 1/4 W, 5%
R932	315-0621-01			620 $\Omega$ , 1/4 W, 5%
R940	308-0503-00	300500	300540	6.8 $\Omega$ , (nominal value) selected
R940	309-0096-00	300541		10 $\Omega$ , 1/2 W, 1%
R941	315-0393-01			39 k $\Omega$ , 1/4 W, 5%
R942	311-1294-00	300500	300885	10 $\Omega$ , Var
R942	311-1294-01	300886		10 $\Omega$ , Var

<sup>1</sup>Selected and added if necessary.

## ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R943	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R946	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R948	315-0221-01			220 $\Omega$ , 1/4 W, 5%
R962	315-0150-01			15 $\Omega$ , 1/4 W, 5%
R972	315-0103-02			10 k $\Omega$ , 1/4 W, 5%
R974	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R976	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R1002	321-0354-30			47.5 k $\Omega$ , 1/8 W, 1%
R1004	311-0633-00			5 k $\Omega$ , Var
R1006	321-0308-30			15.8 k $\Omega$ , 1/8 W, 1%
R1008	321-0348-30			41.2 k $\Omega$ , 1/8 W, 1%
R1009	315-0474-01			470 k $\Omega$ , 1/4 W, 5%
R1010	315-0333-01			33 k $\Omega$ , 1/4 W, 5%
R1012	315-0182-02			1.8 k $\Omega$ , 1/4 W, 5%
R1018	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R1020	315-0472-01			4.7 k $\Omega$ , 1/4 W, 5%
R1022	315-0470-02			47 $\Omega$ , 1/4 W, 5%
R1024	315-0162-01			1.6 k $\Omega$ , 1/4 W, 5%
R1026	321-0334-30			29.4 k $\Omega$ , 1/8 W, 1%
R1028	321-0300-30			13 k $\Omega$ , 1/8 W, 1%
R1030	311-0609-00			2 k $\Omega$ , Var
R1032	321-0320-30			21 k $\Omega$ , 1/8 W, 1%
R1040	301-0226-01			22 M $\Omega$ , 1/2 W, 5%
R1042	311-0690-01			5 M $\Omega$ , Var
R1044	315-0105-01			1 M $\Omega$ , (nominal value) selected
R1046	311-1293-00	300500	300885	1 M $\Omega$ , Var
R1046	311-1293-01	300886		1 M $\Omega$ , Var
R1048	301-0106-01			10 M $\Omega$ , 1/2 W, 5%
R1049	301-0475-01			4.7 M $\Omega$ , 1/2 W, 5%
R1050	311-0690-01			5 M $\Omega$ , Var
R1051A	315-0183-02			18 k $\Omega$ , 1/4 W, 5%
R1051B	315-0392-01			3.9 k $\Omega$ , 1/4 W, 5%
R1051C	321-0193-30			1 k $\Omega$ , 1/8 W, 1%
R1052	301-0685-01			6.8 M $\Omega$ , 1/2 W, 5%
R1053	301-0475-01			4.7 M $\Omega$ , 1/2 W, 5%
R1054	301-0475-01			4.7 M $\Omega$ , 1/2 W, 5%
R1055	301-0475-01			4.7 M $\Omega$ , 1/2 W, 5%
R1056	315-0470-02			47 $\Omega$ , 1/4 W, 5%
R1057	315-0470-02			47 $\Omega$ , 1/4 W, 5%
R1058	315-0754-02			750 k $\Omega$ , 1/4 W, 5%
R1059	315-0204-01			200 k $\Omega$ , 1/4 W, 5%
R1060	311-0607-00			10 k $\Omega$ , Var
R1062	311-0660-00			200 k $\Omega$ , Var
R1064	315-0204-01			200 k $\Omega$ , 1/4 W, 5%
R1066	315-0244-01			240 k $\Omega$ , 1/4 W, 5%
R1068	311-0660-00			200 k $\Omega$ , Var
R1070	315-0393-01			39 k $\Omega$ , 1/4 W, 5%
R1105	315-0562-01			5.6 k $\Omega$ , 1/4 W, 5%
R1115	308-0463-00			0.3 $\Omega$ , 3 W, WW, 1%
R1118	315-0472-01			4.7 k $\Omega$ , 1/4 W, 5%
R1119	315-0100-01			10 $\Omega$ , 1/4 W, 5%
R1120	315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R1123	315-0471-02			470 $\Omega$ , 1/4 W, 5%
R1130	315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%

## ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)					
R1133		301-0185-01			1.8 M $\Omega$ , 1/2 W, 5%
R1135		315-0752-01			7.5 k $\Omega$ , 1/4 W, 5%
R1137		315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R1138		315-0102-01			1 k $\Omega$ , 1/4 W, 5%
R1139		315-0152-01			1.5 k $\Omega$ , 1/4 W, 5%
R1141		315-0272-02			2.7 k $\Omega$ , 1/4 W, 5%
R1143		321-0341-30			34.8 k $\Omega$ , 1/8 W, 1%
R1144		311-0635-00			1 k $\Omega$ , Var
SWITCHES					
S20 <sup>1</sup>		670-1829-00			Pushbutton, AC-GND-DC (INPUT COUPLING CH1)
S30		105-0302-00			Actuator assembly, VOLTS/DIV CH1
S40		260-0905-02			Slide, X10 VERT GAIN CH1
S220 <sup>1</sup>		670-1830-00			Pushbutton, AC-GND-DC (INPUT COUPLING CH2)
S230		105-0302-00			Actuator assembly, VOLTS/DIV CH2
S240		260-0905-02			Slide X10 VERT GAIN CH2
S302		260-1132-02			PUSH, INVERT CH2
S330 <sup>1</sup>		260-1367-00			Rotary, VERT MODE
S500 <sup>1</sup>		670-1827-00			Pushbutton, TRIG SOURCE
S535 <sup>1</sup>		260-0905-00			Slide, X10 HORIZ MAG
S540 <sup>1</sup>		670-1828-00			Pushbutton, TRIG SOURCE/COUPLING
S560	wired	262-0957-00	300500	300885	Rotary, TRIGGER SLOPE
S560	wired	262-0957-01	300886		Rotary, TRIGGER SLOPE
S560		260-0886-00			Rotary, TRIGGER SLOPE
S620		105-0301-00			Actuator assembly, TIME/DIV
S710		260-0905-03			Slide, X10 HORIZ MAG PULL
S860		260-1372-00			Slide
S870		260-0834-00			Toggle, POWER
S1112		260-0905-01			Slide FULL CHG/TRICKLE CHG
TRANSFORMERS					
R410		120-0764-00			Toroid
T930		120-0760-00			Blocking
T970		120-0759-00			Fly-back
T980		120-0758-00			Current sensing
T1101		120-0757-00			Power
INTEGRATED CIRCUIT					
U910		156-0053-00			Voltage regulator, UA723C
ELECTRON TUBE					
V1060		154-0667-00			CRT
DIODES, ZENER					
VR95		152-0280-00			Zener, 1N753A, 0.4 W, 6.2 V, 5%
VR692		152-0166-00			Zener, 1N753A, 0.4 W, 6.2 V, 5%
VR760		152-0217-00			Zener, 1N756A, 0.4 W, 8.2 V, 5%
VR882		152-0195-00			Zener, 1N751A, 0.4 W, 5.1 V, 5%
VR887		152-0217-00			Zener, 1N756A, 0.4 W, 8.2 V, 5%
VR898		152-0278-00			Zener, 1N4372A, 0.4 W, 3 V, 5%
VR941		152-0278-00			Zener, 1N4372A, 0.4 W, 3 V, 5%
VR973		152-0195-00			Zener, 1N751A, 0.4 W, 5.1 V, 5%
VR996		152-0166-00			Zener, 1N753A, 0.4 W, 6.2 V, 5%
VR997		152-0166-00			Zener, 1N753A, 0.4 W, 6.2 V, 5%
VR1051		152-0359-00			Zener, 0.25 W, 9 V, 5%
VR1062		152-0281-00			Zener, 1N969B, 0.4 W, 22 V, 5%
VR1149		152-0166-00			Zener, 1N753A, 0.4 W, 6.2 V, 5%

<sup>1</sup>See Mechanical Parts List for replacement parts.





# SECTION 7

## DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

### Symbols and Reference Designators

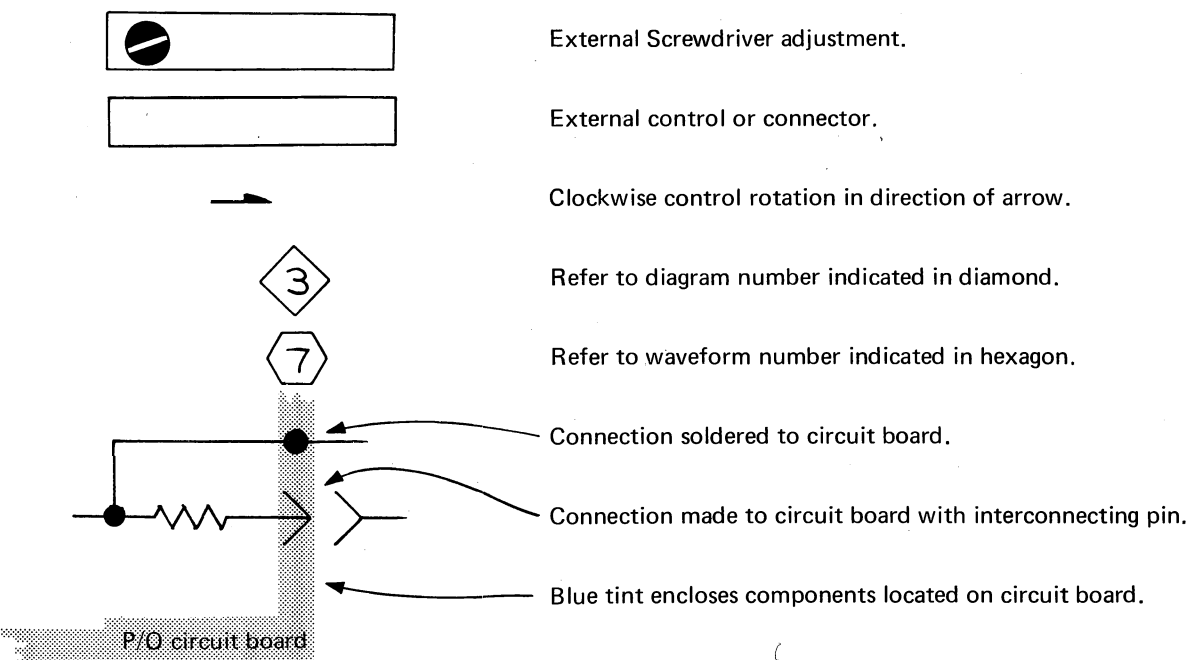
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).  
 Values less than one are in microfarads ( $\mu$ F).  
 Resistors = Ohms ( $\Omega$ )

Symbols used on the diagrams are based on USA Standard Y32.2-1967.

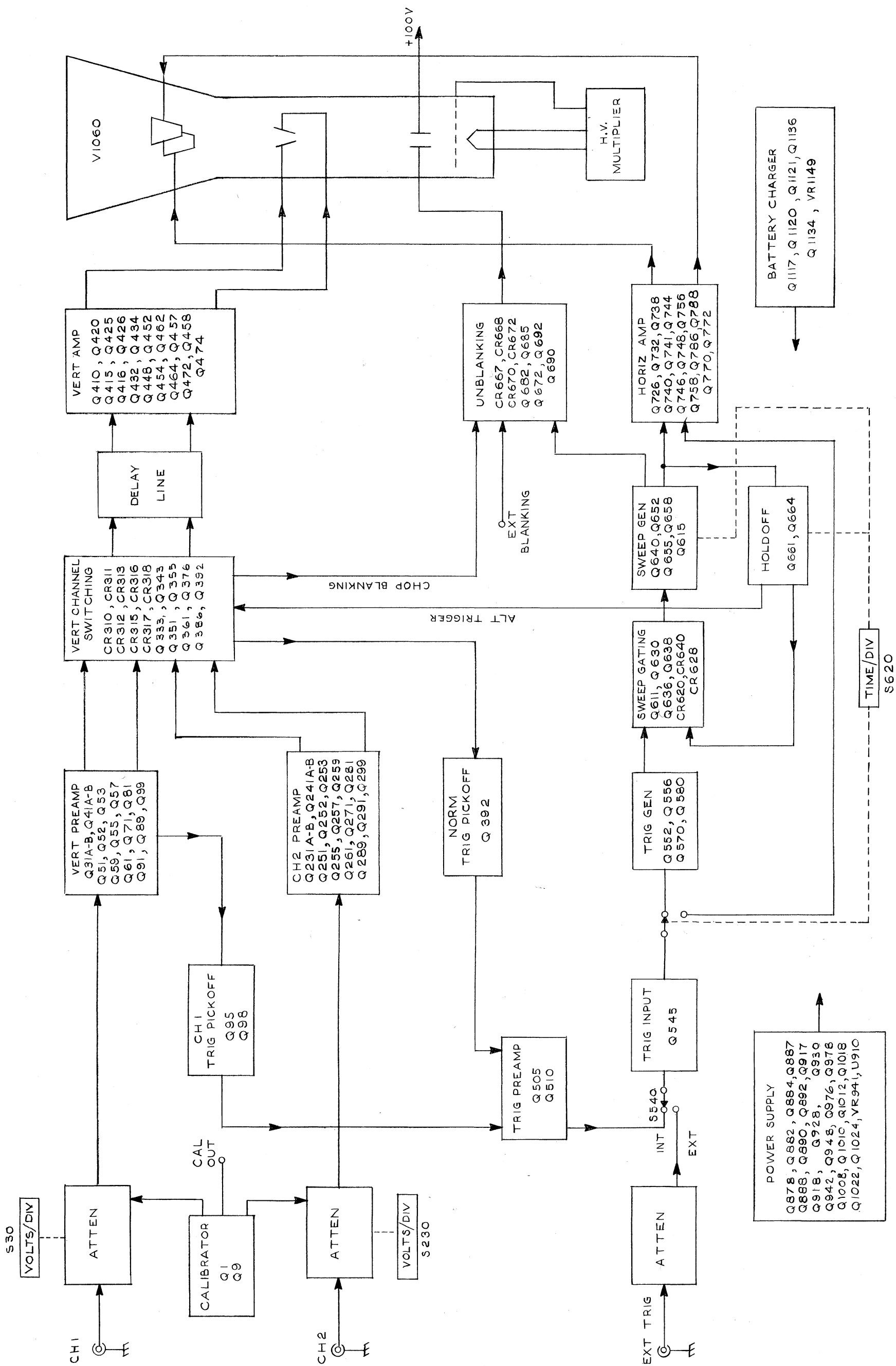
Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc.)	LR	Inductor/resistor combination
AT	Attenuator, fixed or variable	M	Meter
B	Motor	Q	Transistor or silicon-controlled rectifier
BT	Battery	P	Connector, movable portion
C	Capacitor, fixed or variable	R	Resistor, fixed or variable
CR	Diode, signal or rectifier	RT	Thermistor
DL	Delay line	S	Switch
DS	Indicating device (lamp)	T	Transformer
F	Fuse	TP	Test point
FL	Filter	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
H	Heat dissipating device (heat sink, heat radiator, etc.)	V	Electron tube
HR	Heater	VR	Voltage regulator (zener diode, etc.)
J	Connector, stationary portion	Y	Crystal
K	Relay		
L	Inductor, fixed or variable		



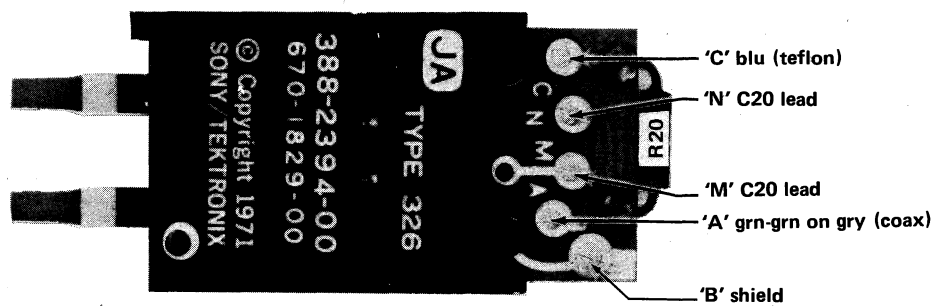
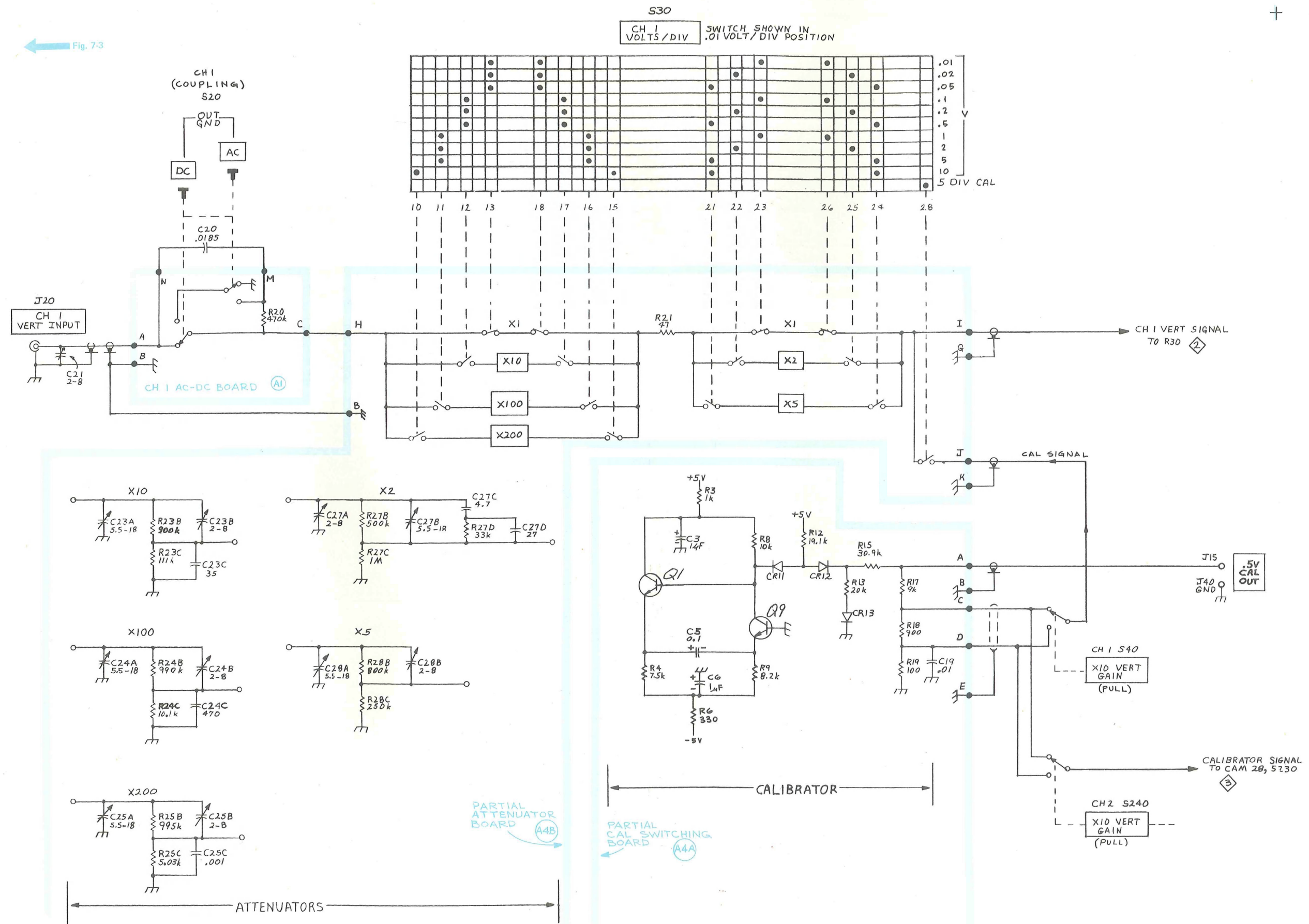


Fig. 7-2

Fig. 7-1. A1. CH 1 AC-DC

A1

Fig. 7-3



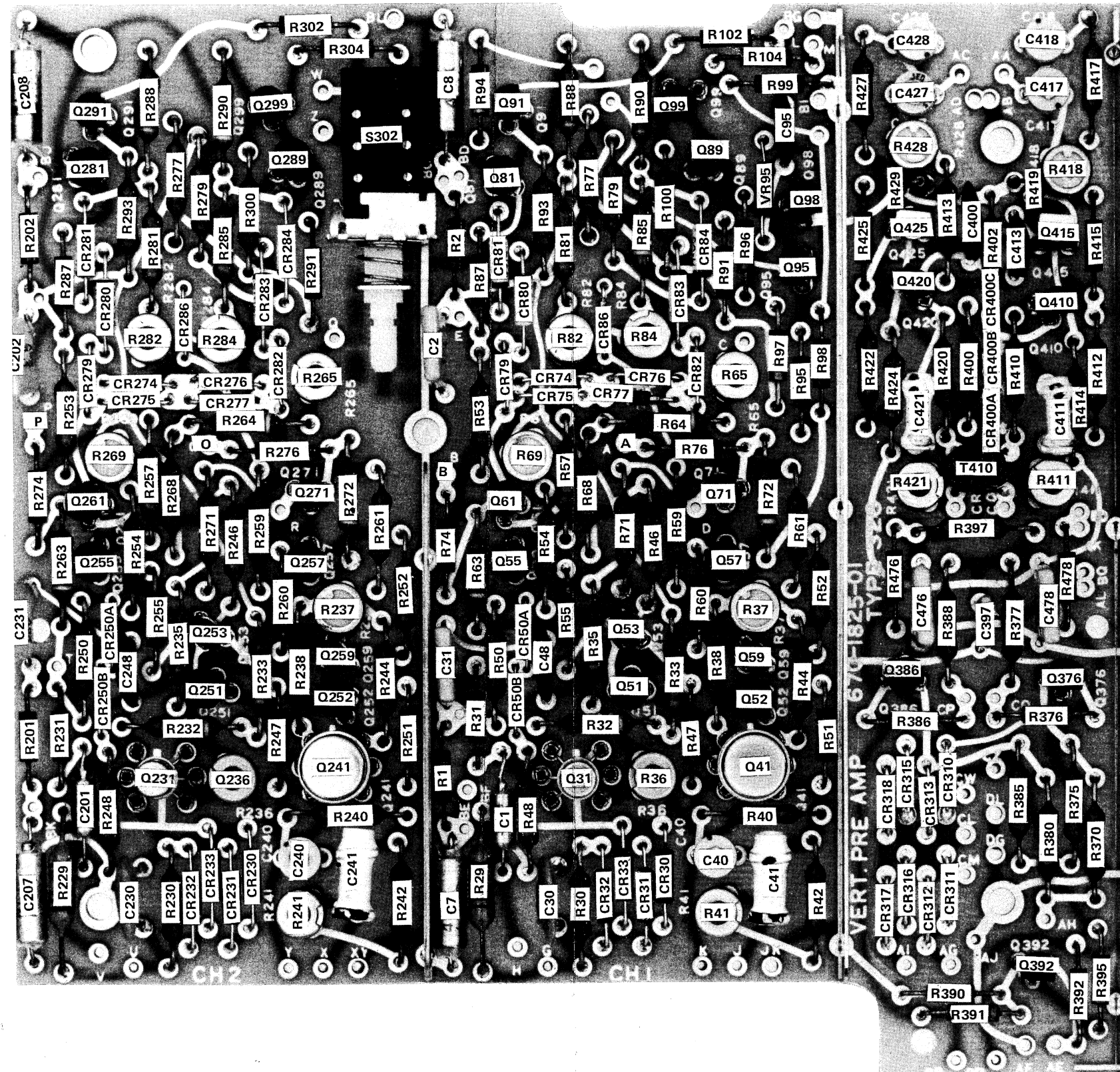


Fig. 7-4. A3 Vertical Preamp component location.



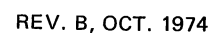
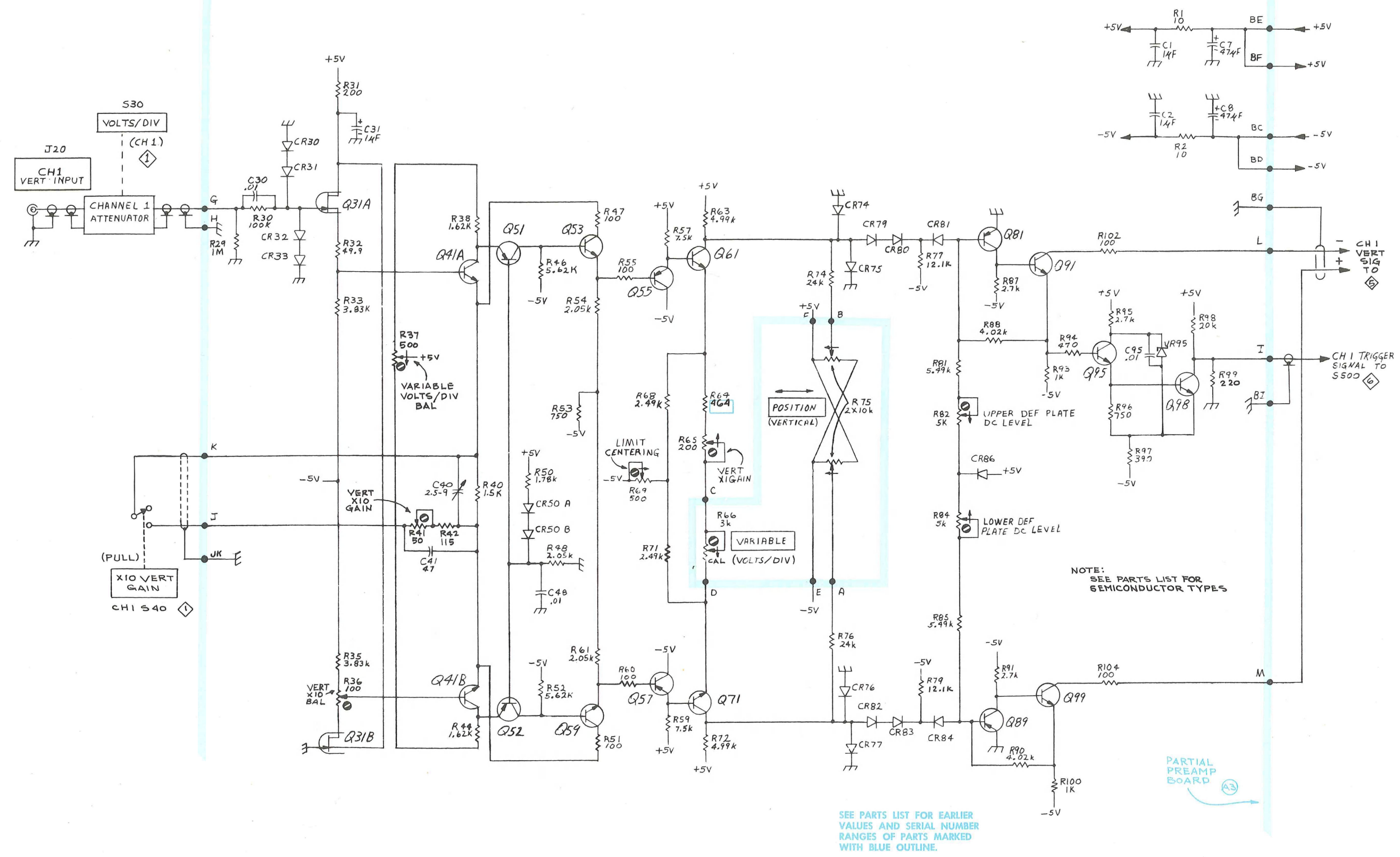


Fig. 7-5





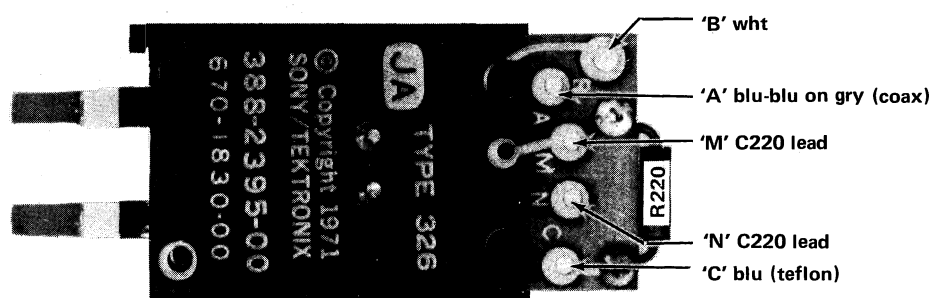
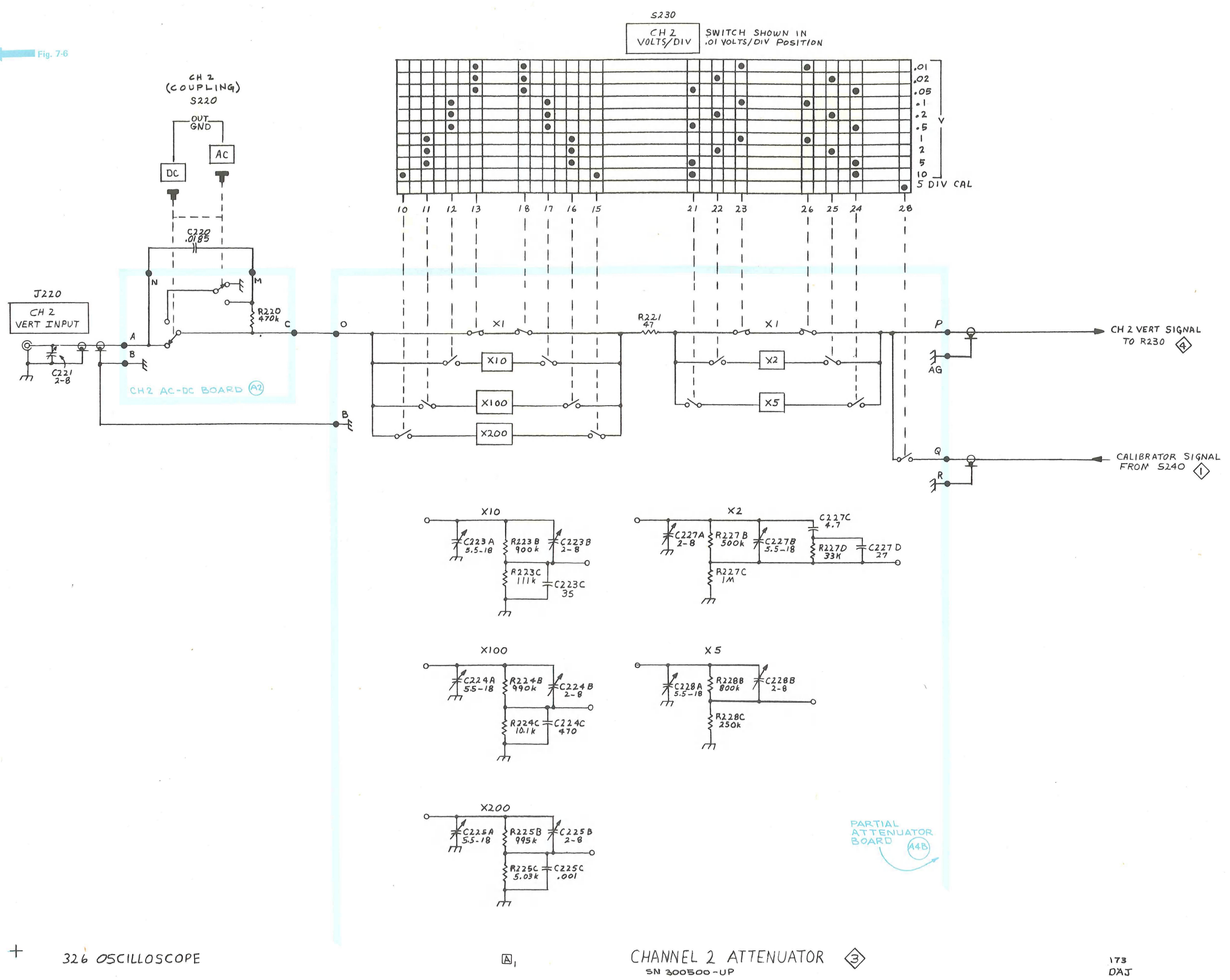


Fig. 7-6. A2 Ch 2 AC-DC board.

Fig. 7-6





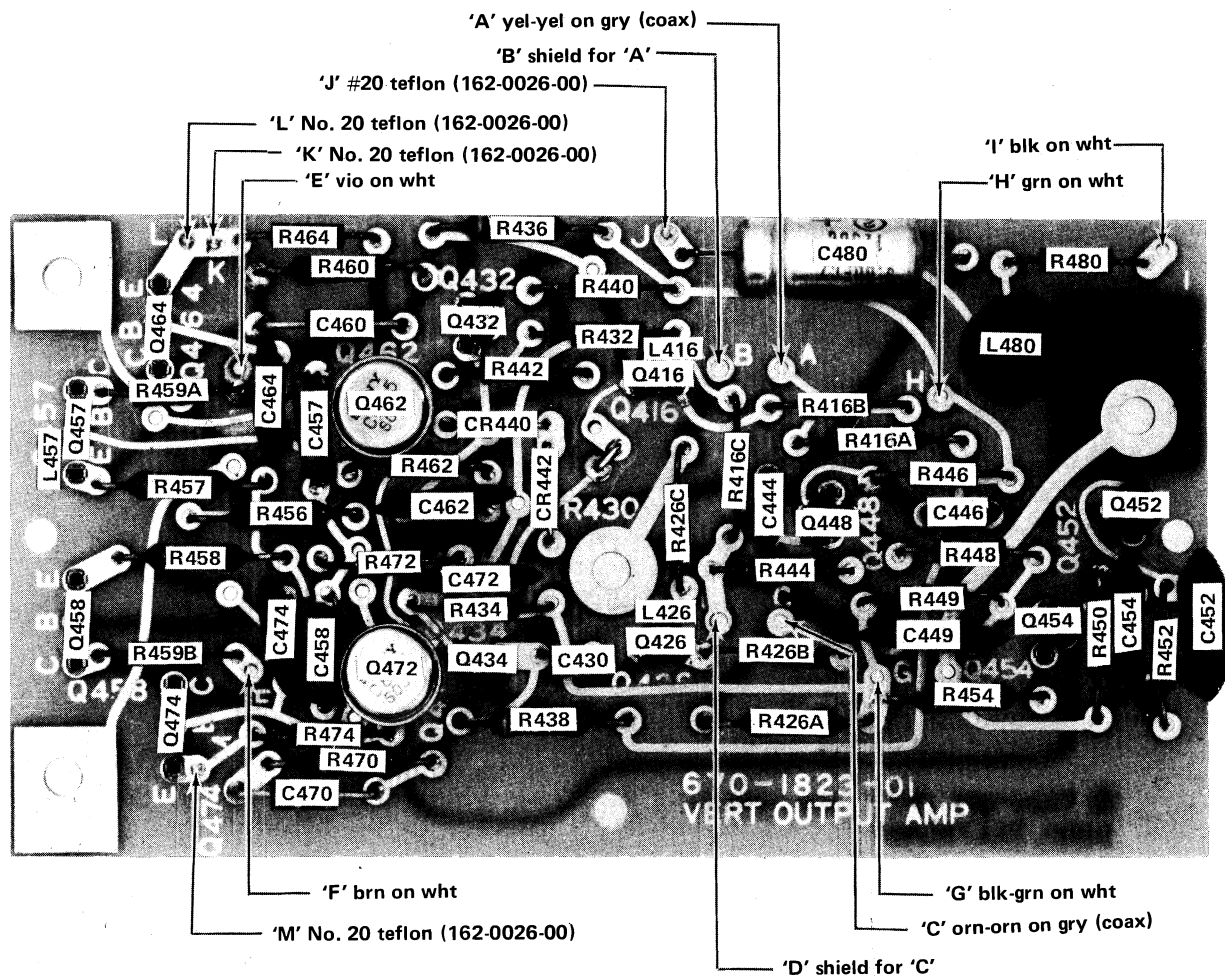
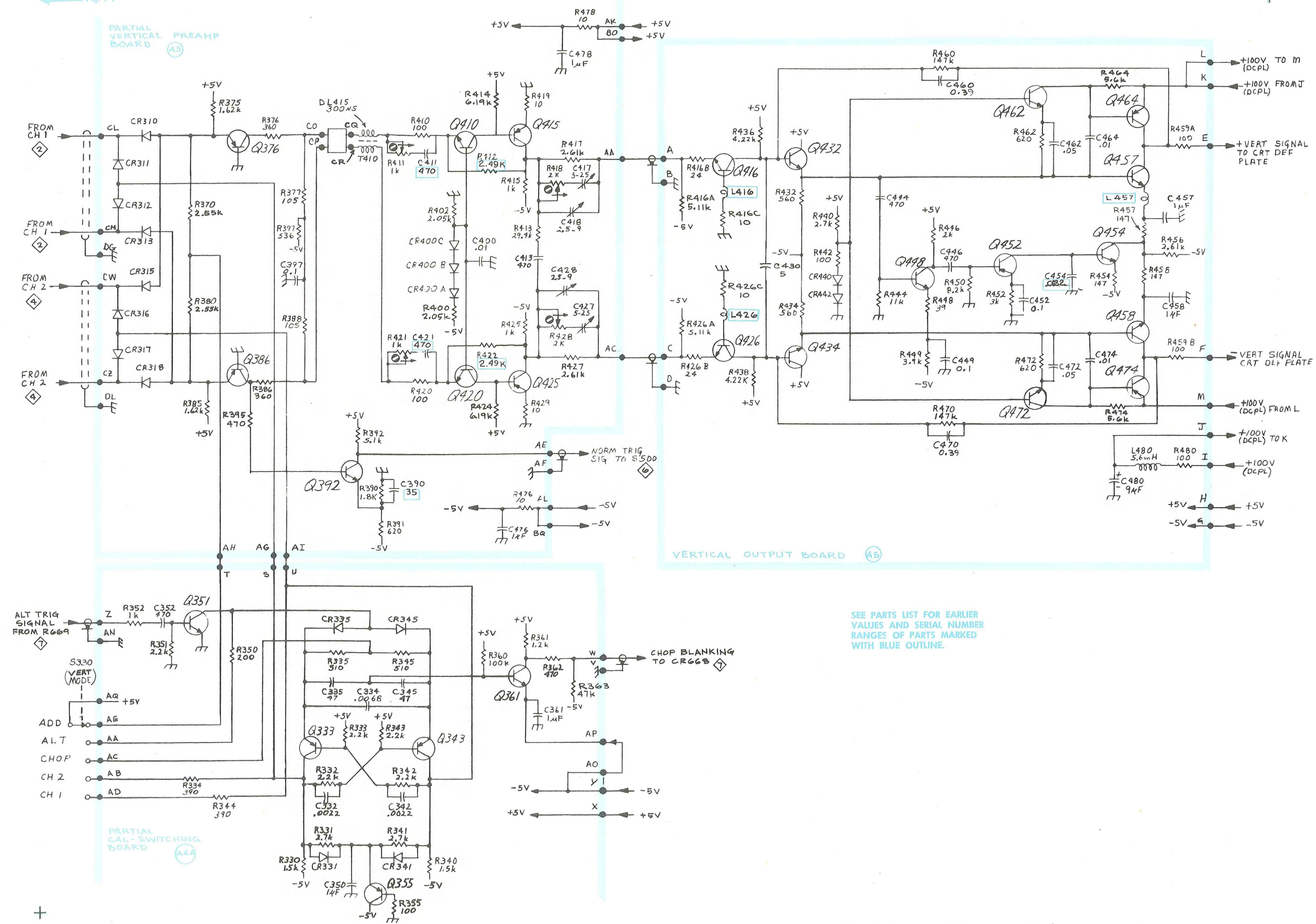


Fig. 7-7. A5 Vertical Output board component location.



Fig. 7-7



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS MARKED WITH BLUE OUTLINE.

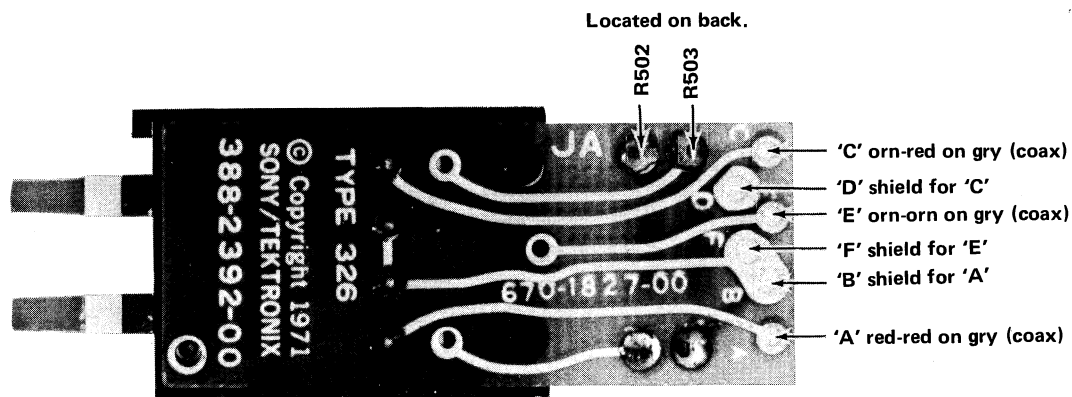


Fig. 7-8. A6 Trigger Source board component location and wiring color codes.

A

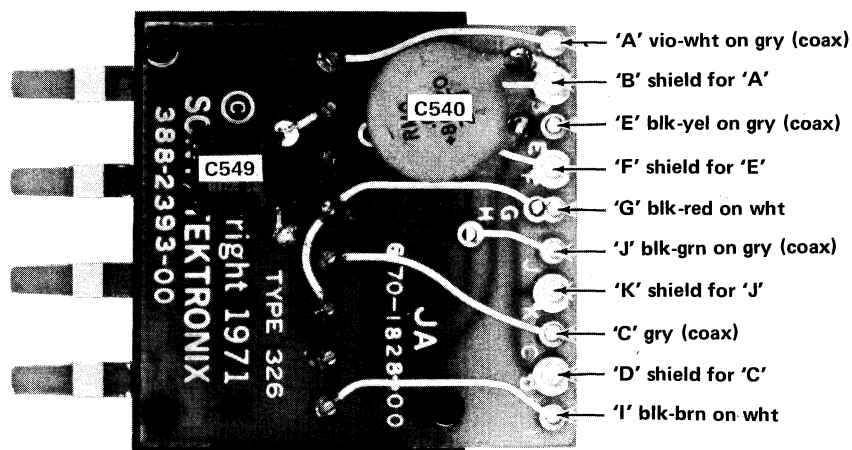
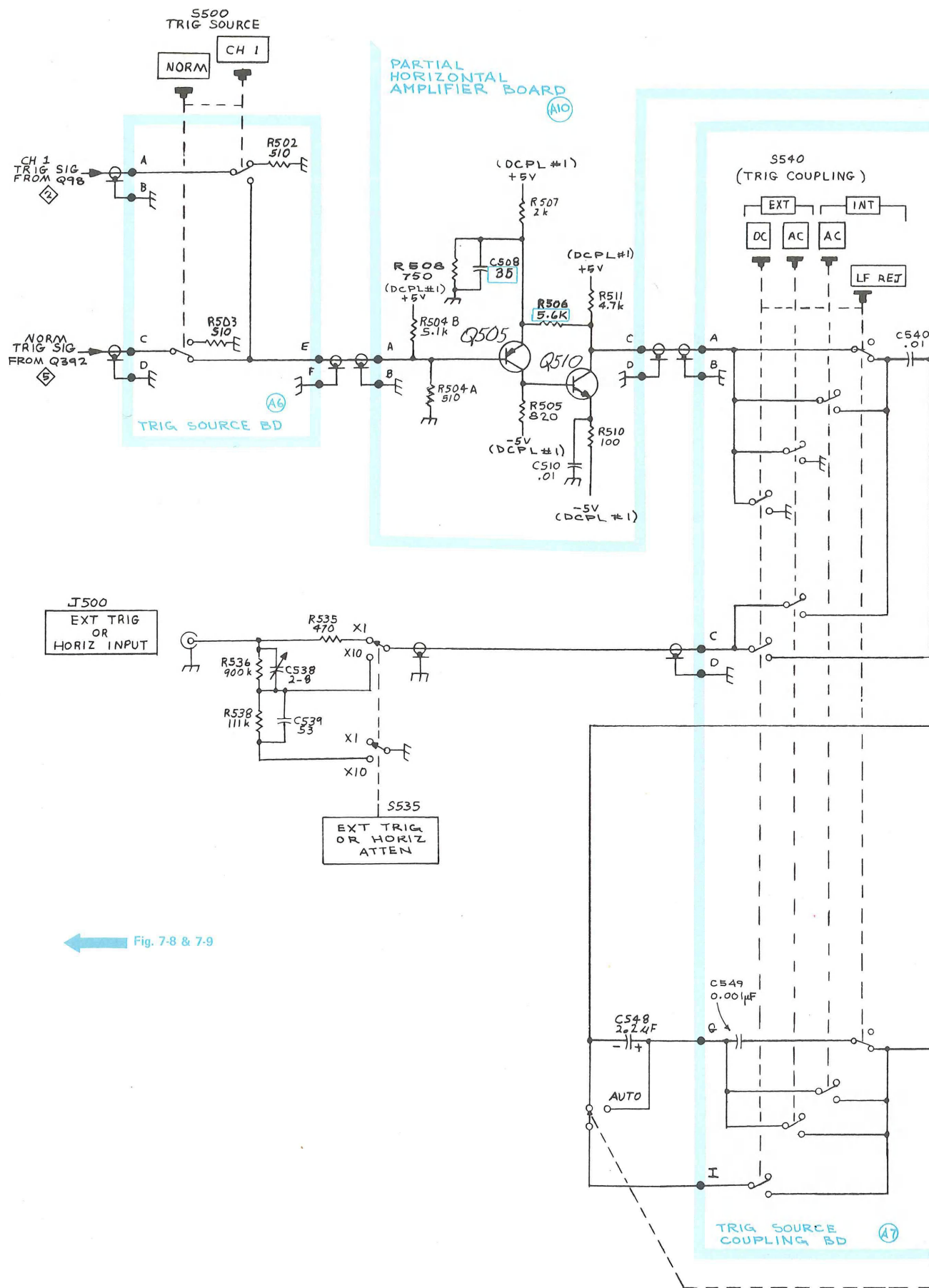
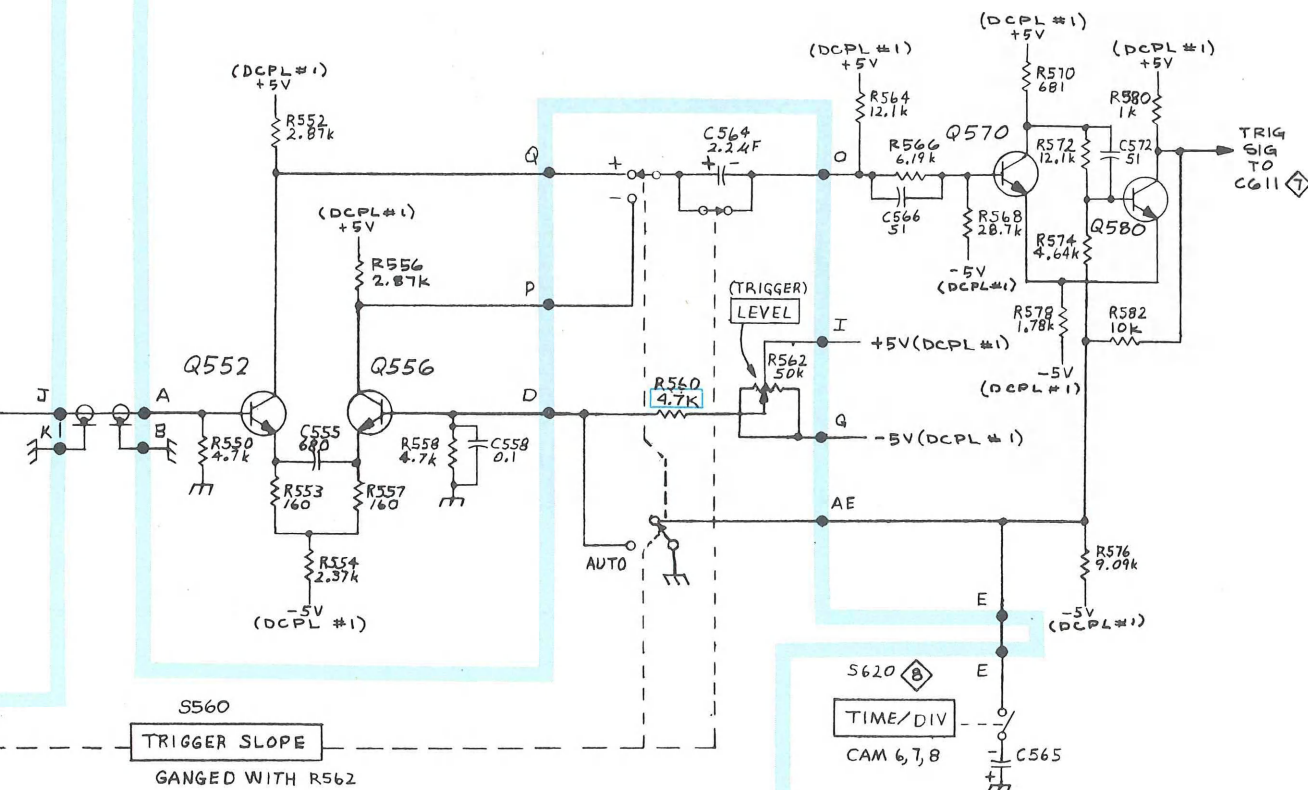
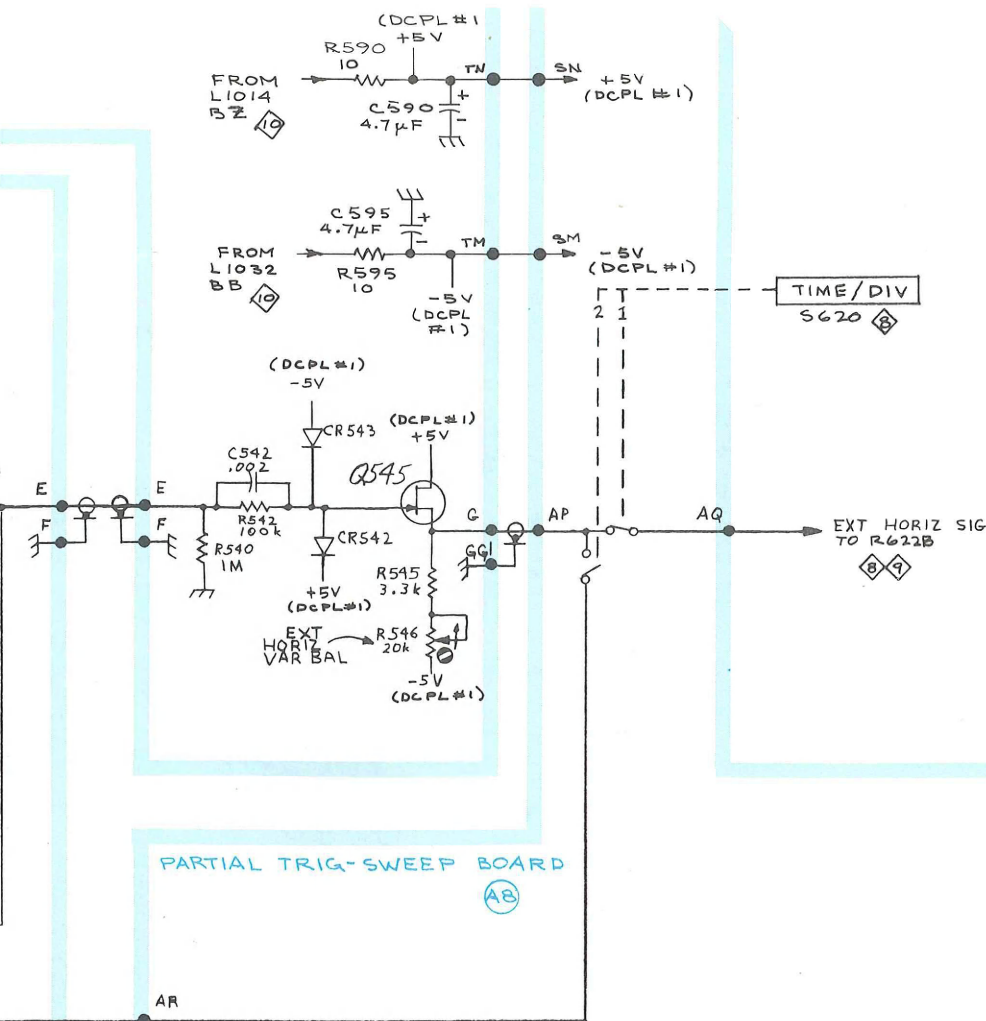


Fig. 7-9. A7 Trigger Source Coupling board.

A



← Fig. 7-8 & 7-9



TRIGGER GENERATOR (6)  
SN 300 300

173  
DAJ

TRIGGER GENERATOR (6)



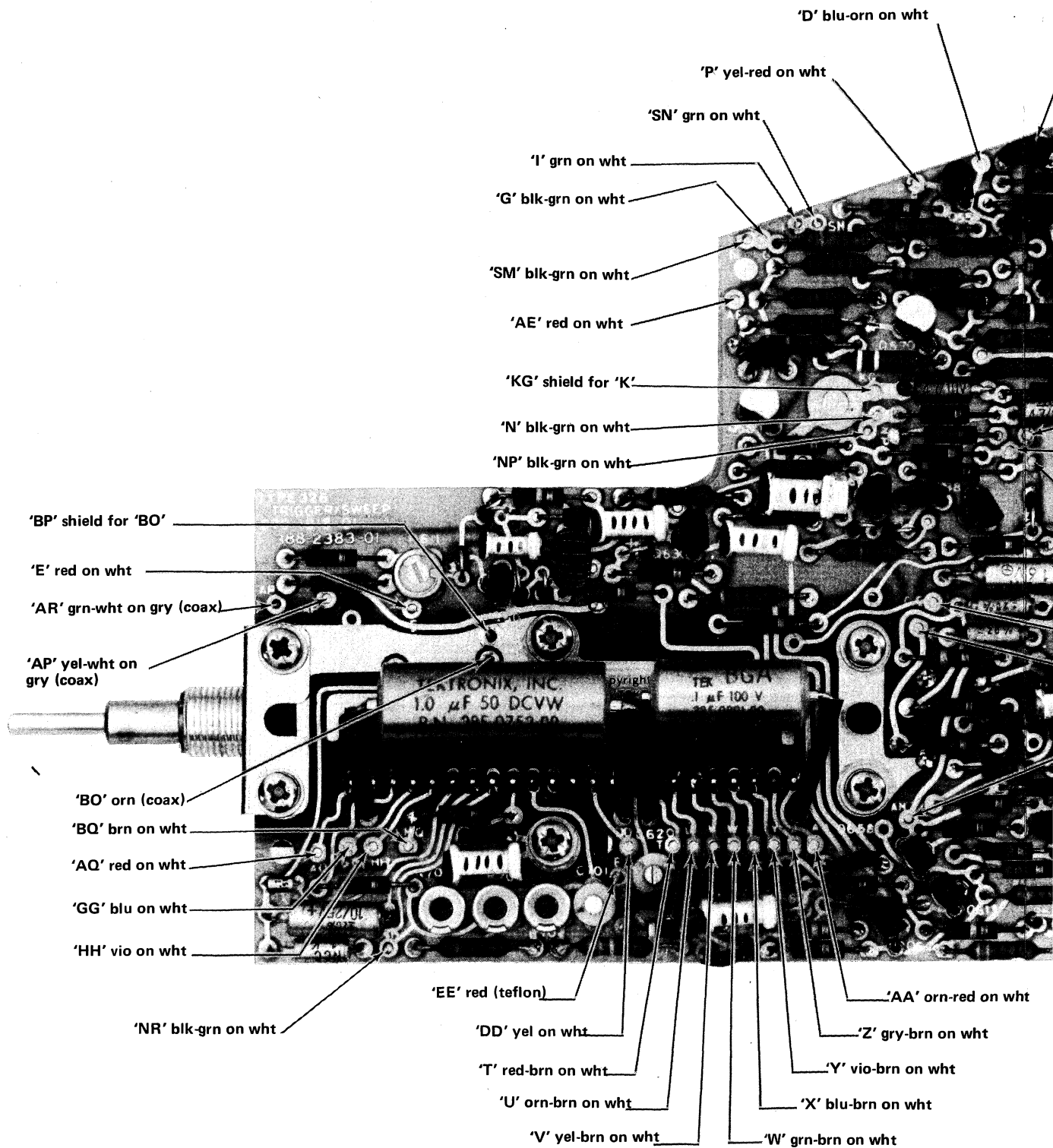
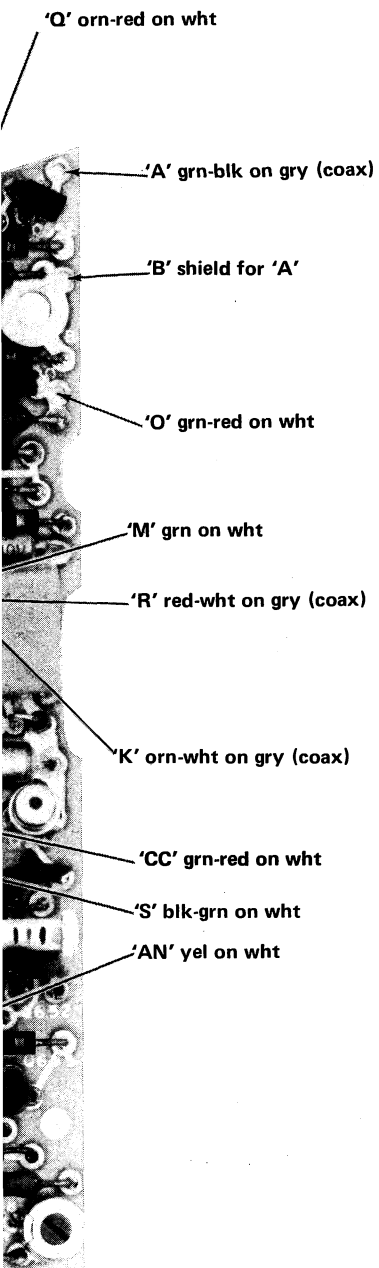


Fig. 7-10. A8 Trigger-Sweep board wiring color code.



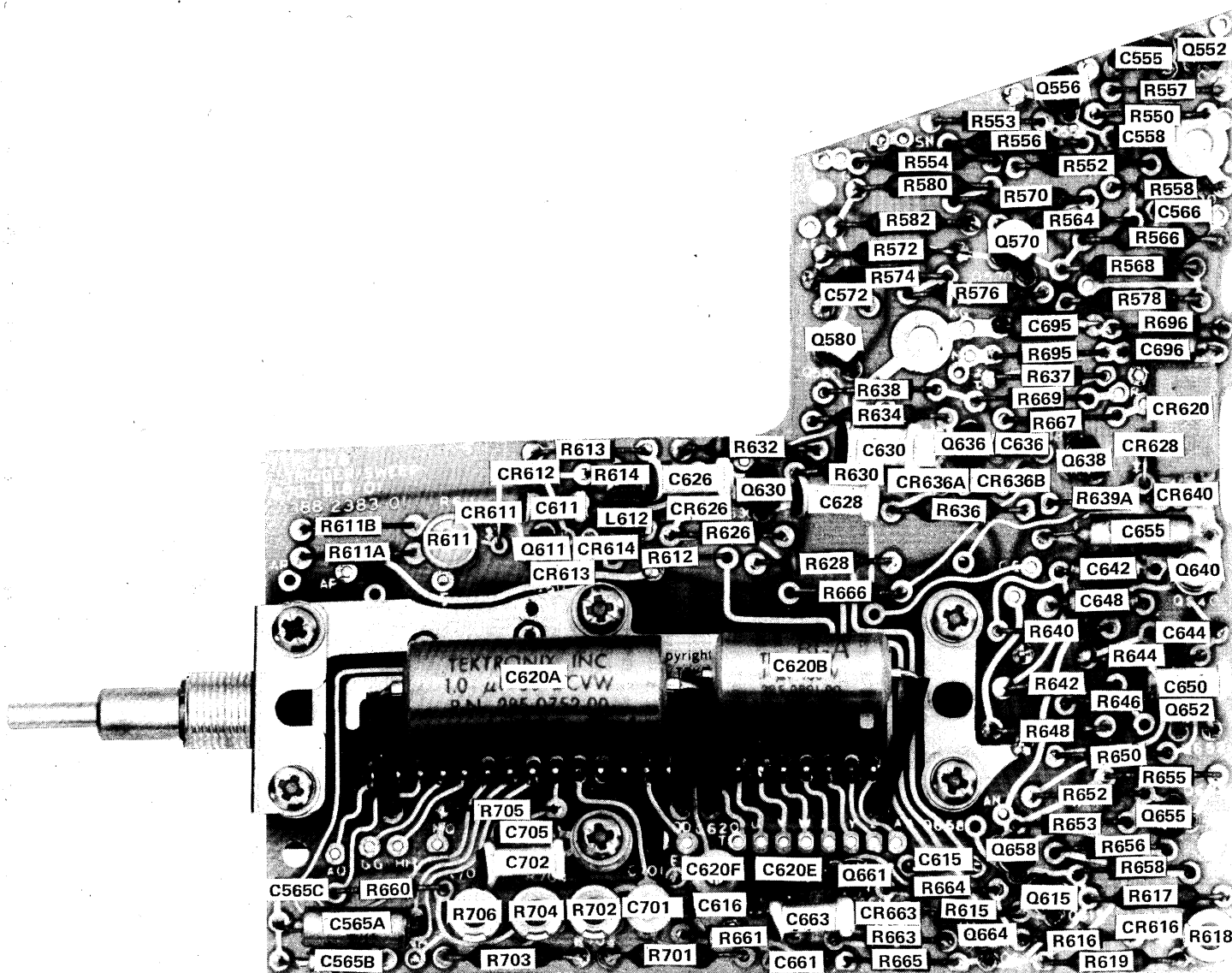


Fig. 7-11. A8 Trigger-Sweep board component locations.

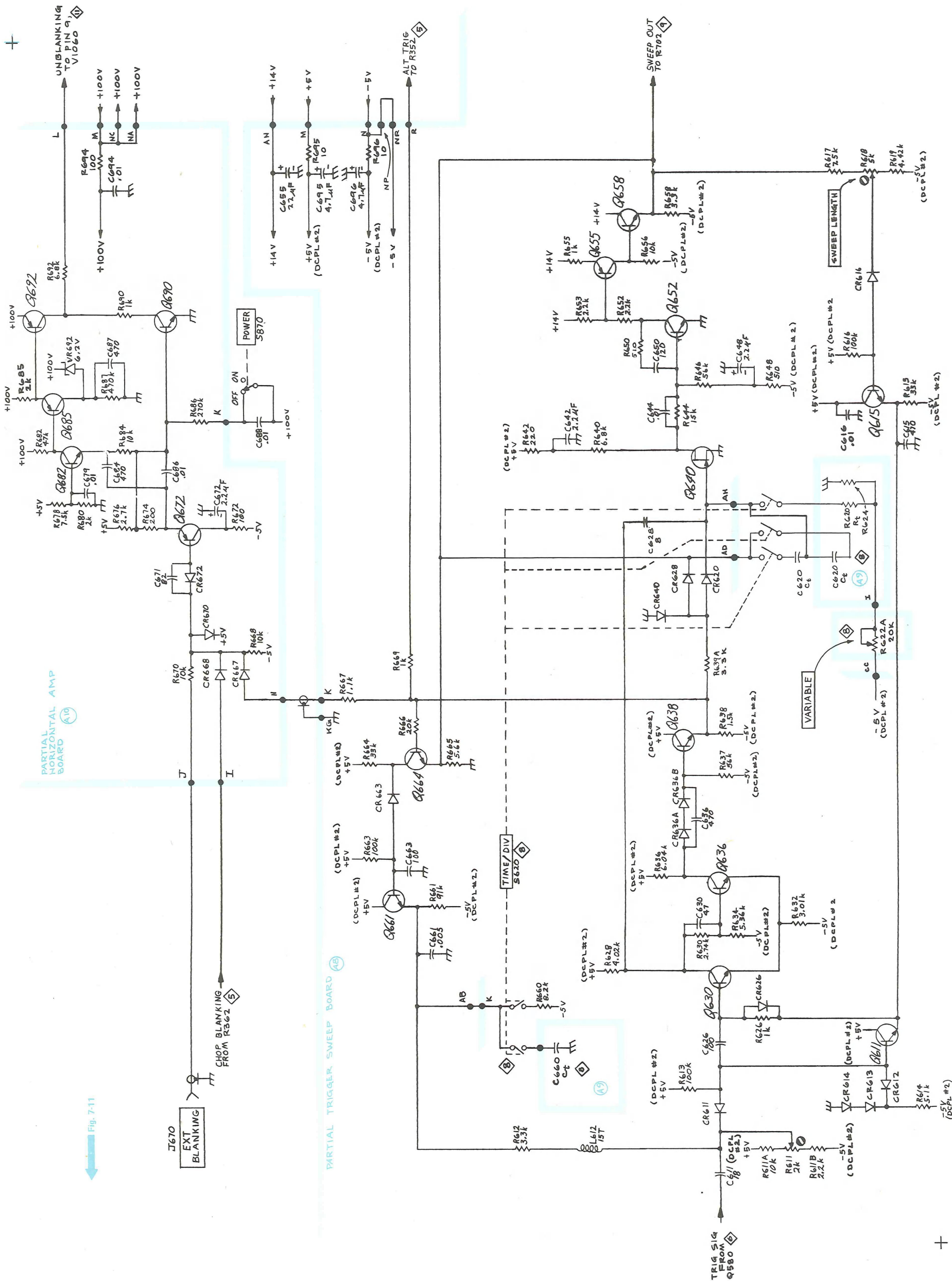


Fig. 7-11

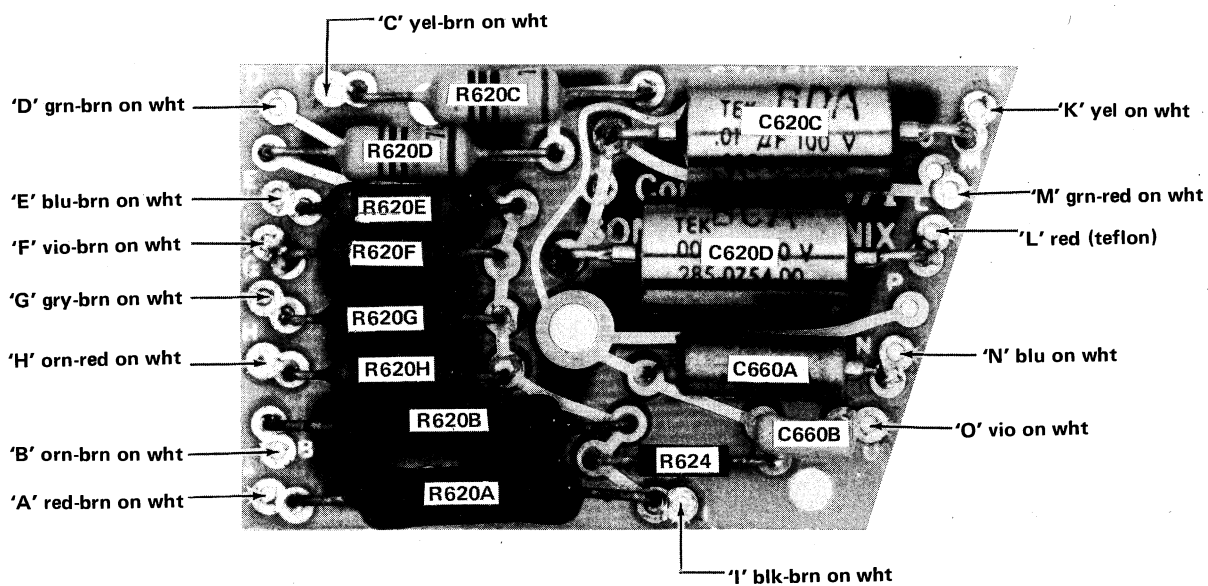
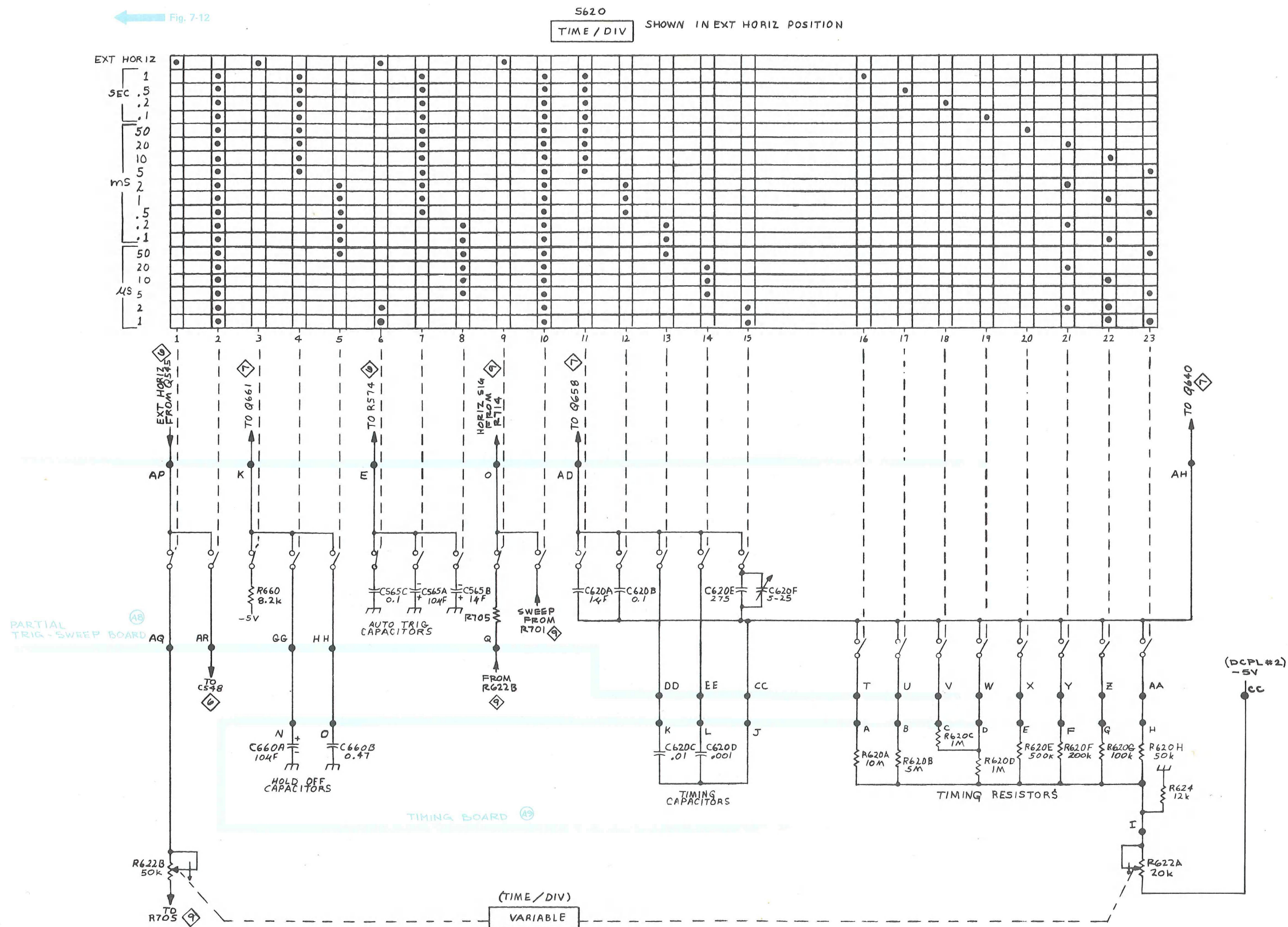


Fig. 7-12. A9 Timing board.





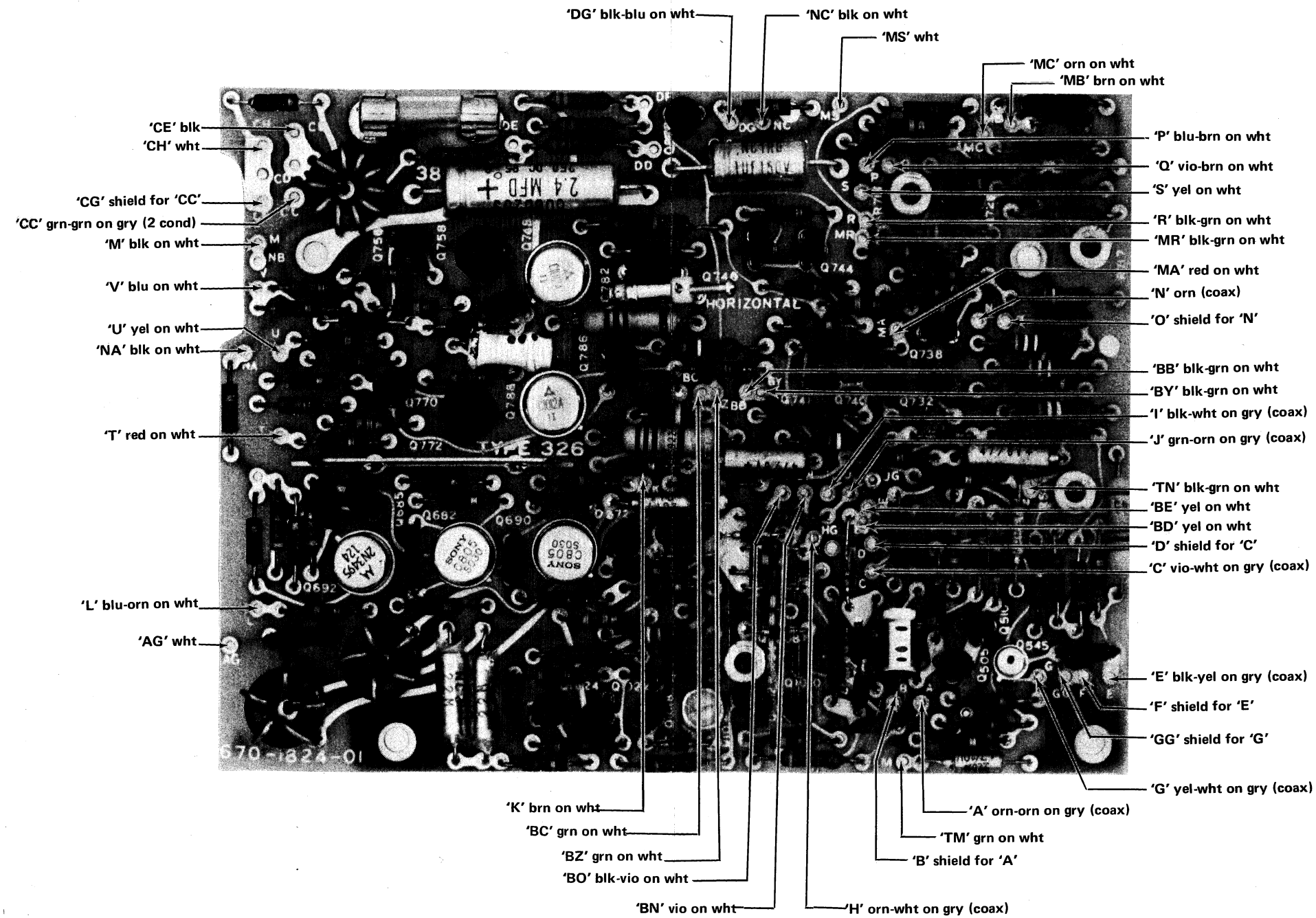


Fig. 7-13. A10 Horizontal Amplifier board wiring color codes.

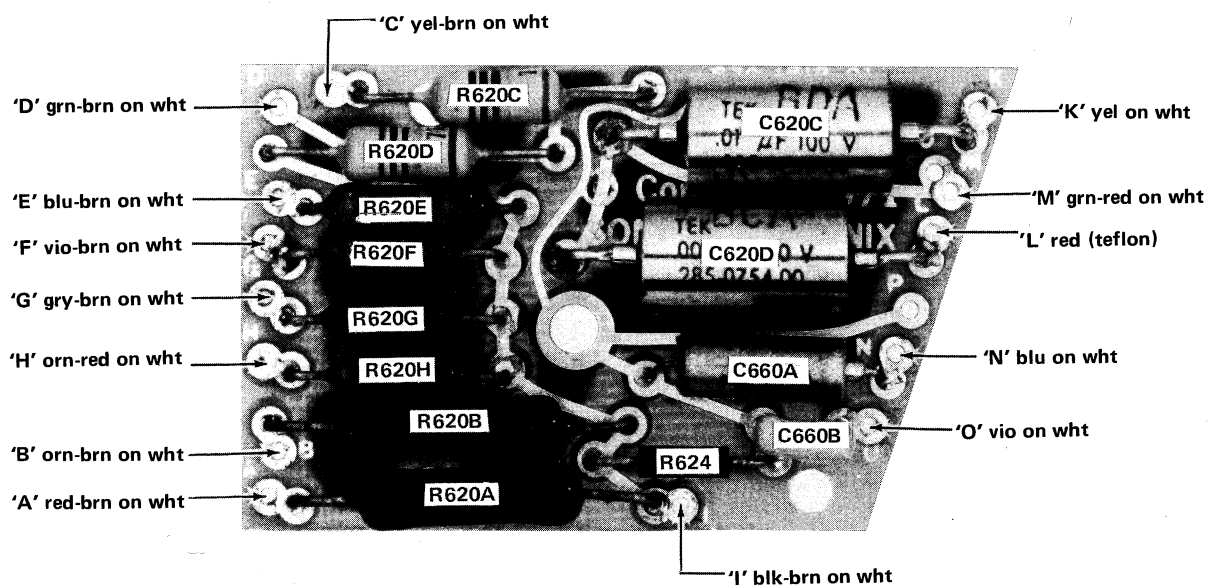
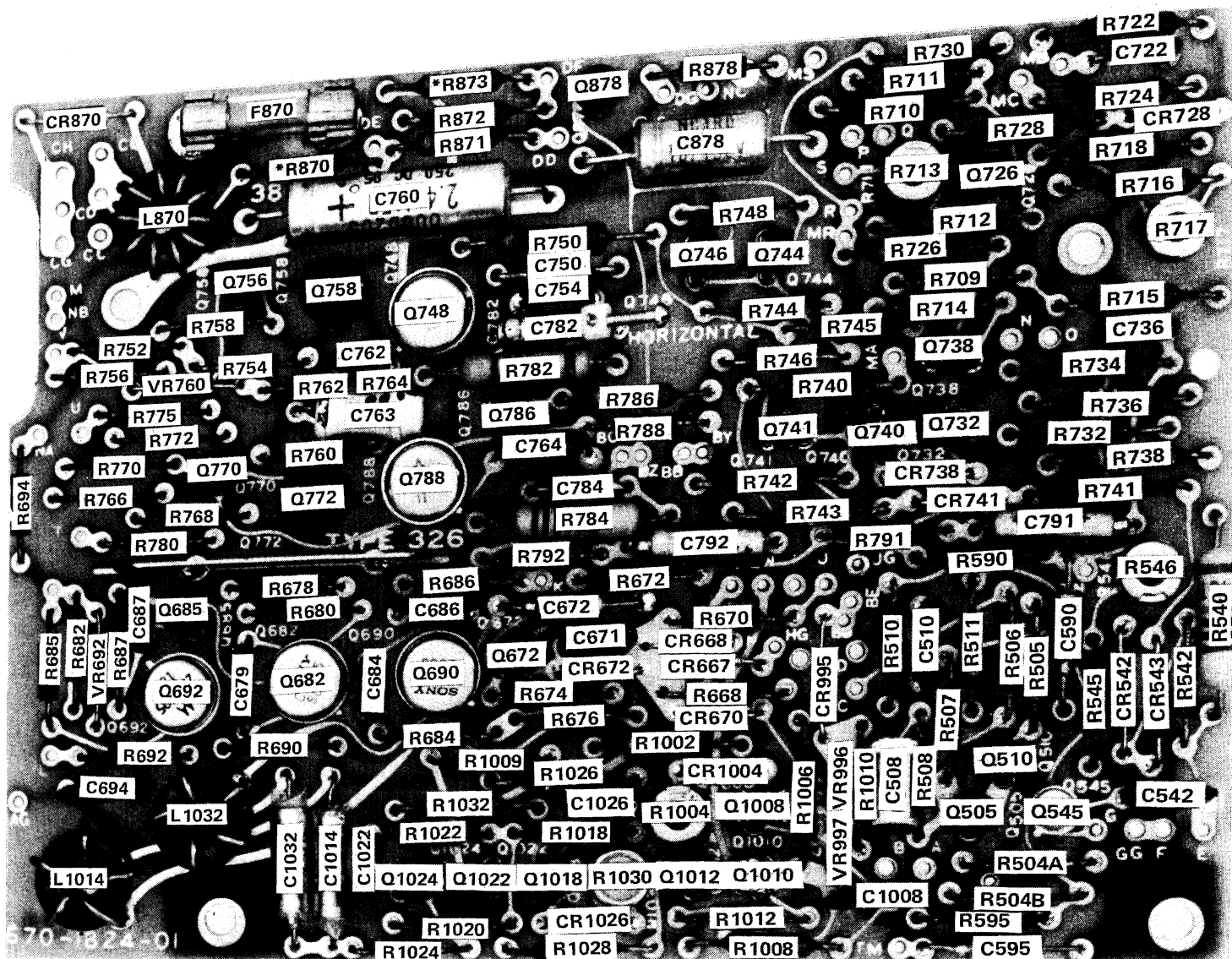


Fig. 7-12. A9 Timing board.





\*See Parts List for  
serial number ranges.

Fig. 7-14. A10 Horizontal Amplifier board component location.



326 OSCILLOSCOPE

HORIZONTAL AMPLIFIER  
SN 300500-UP

A.

DAS

+

A13 POWER REGULATOR-  
CONTROL BOARD

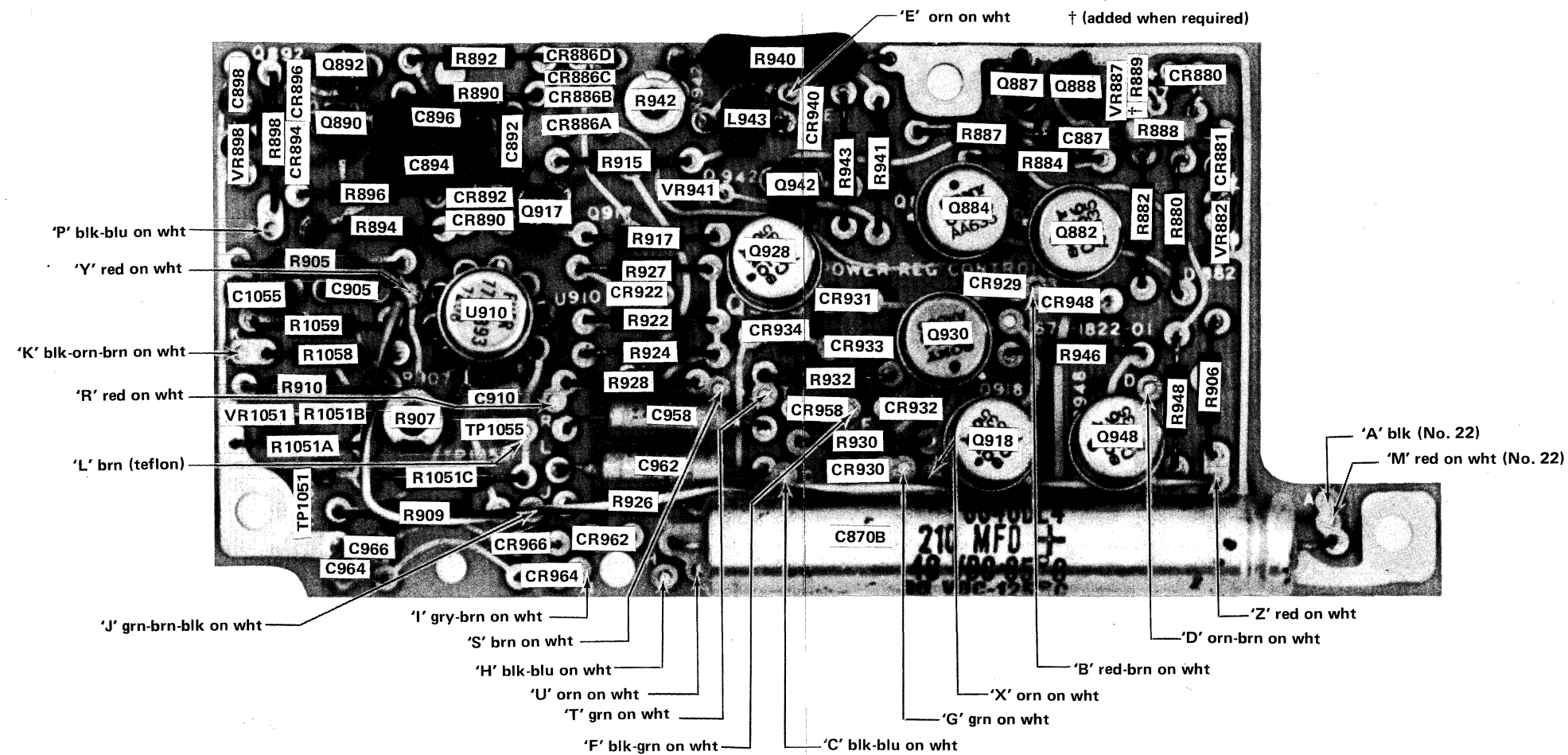


Fig. 7-15. A13 Power Regulator-Control board.

REV. C, OCT. 1974

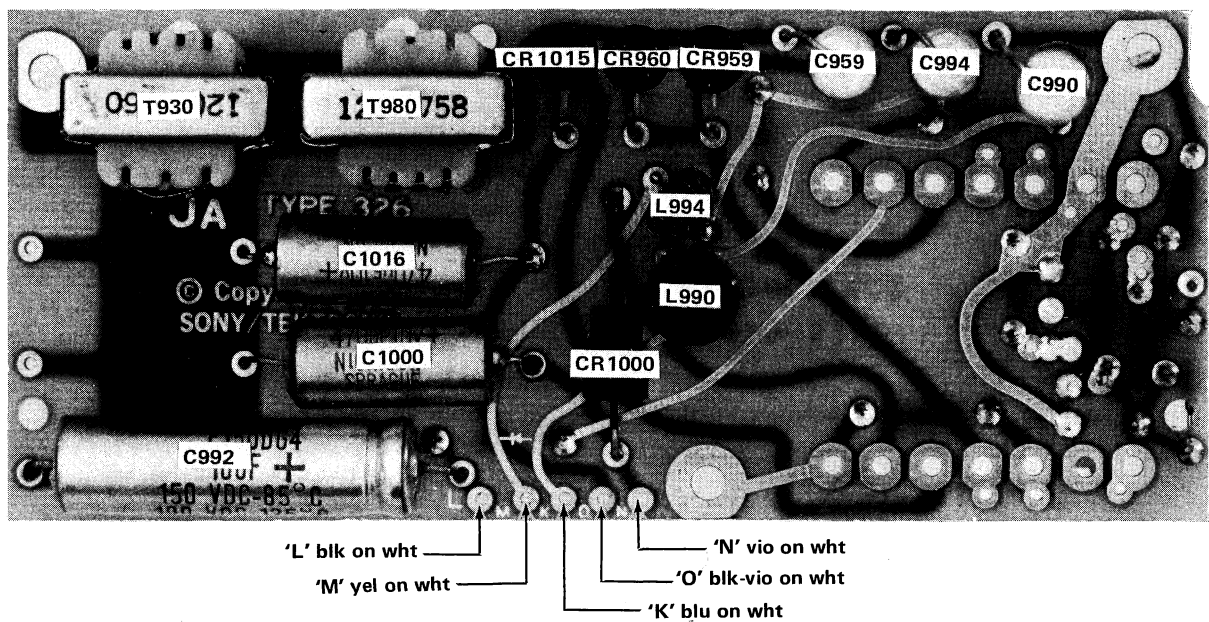


Fig. 7-16A. Front. A11 Power Regulator-Rectifier board.

AI

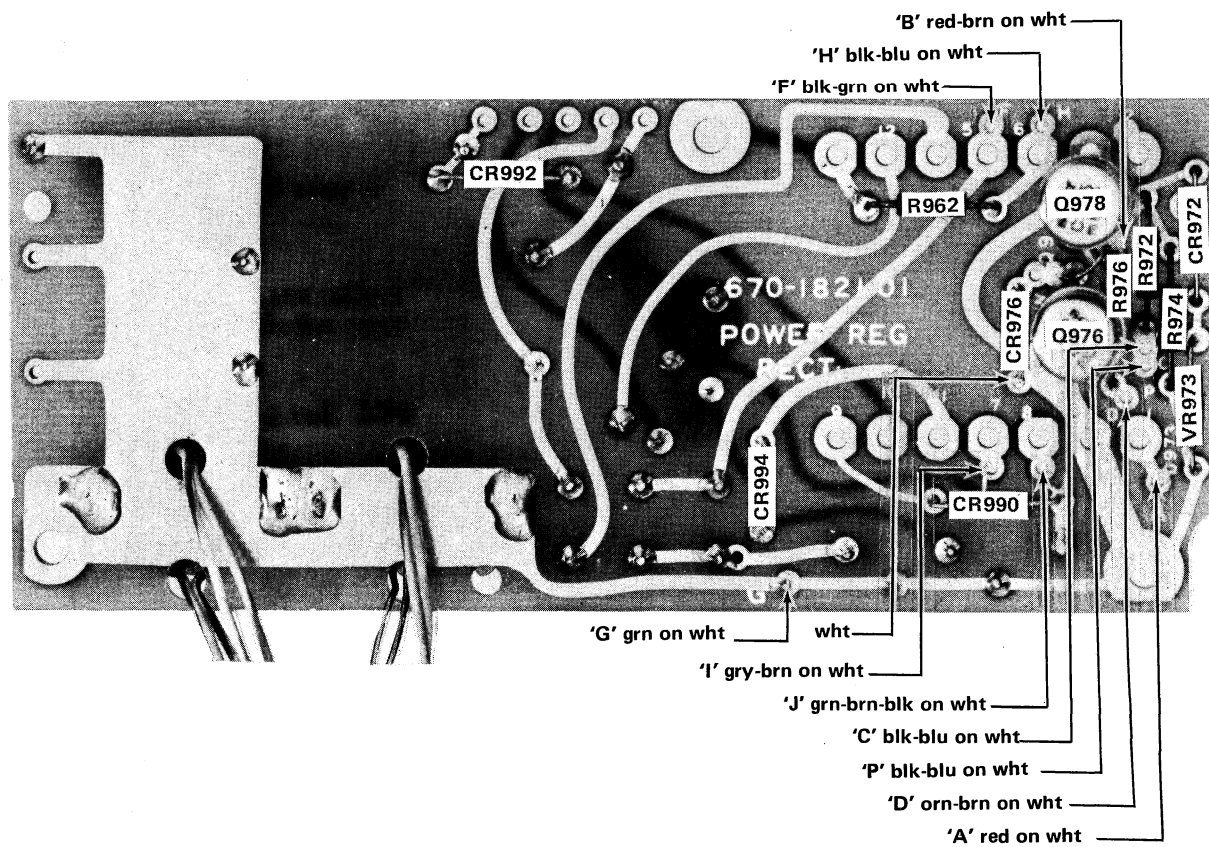
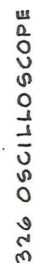


Fig. 7-16B. Back. A11 Power Regulator-Rectifier board.

AI





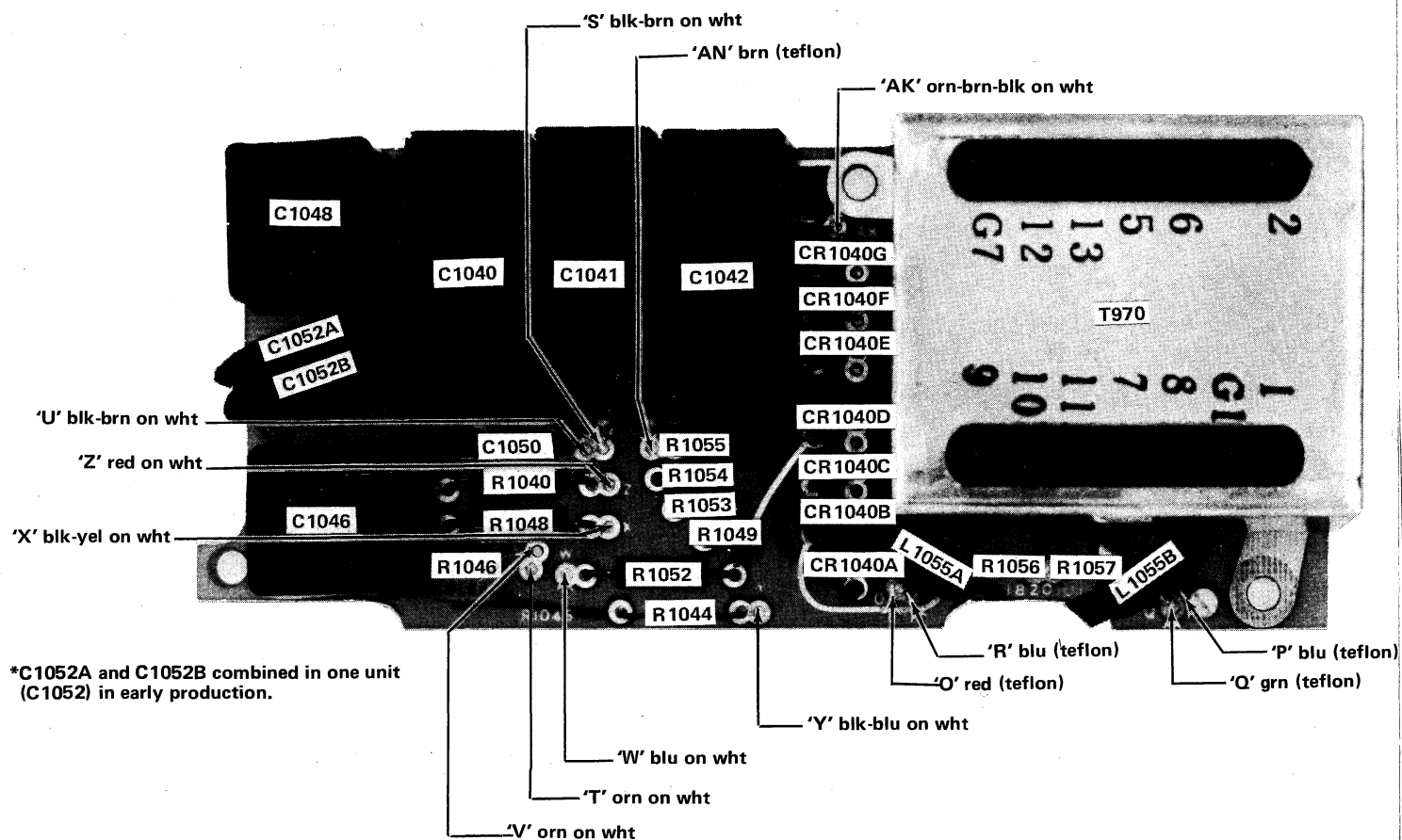
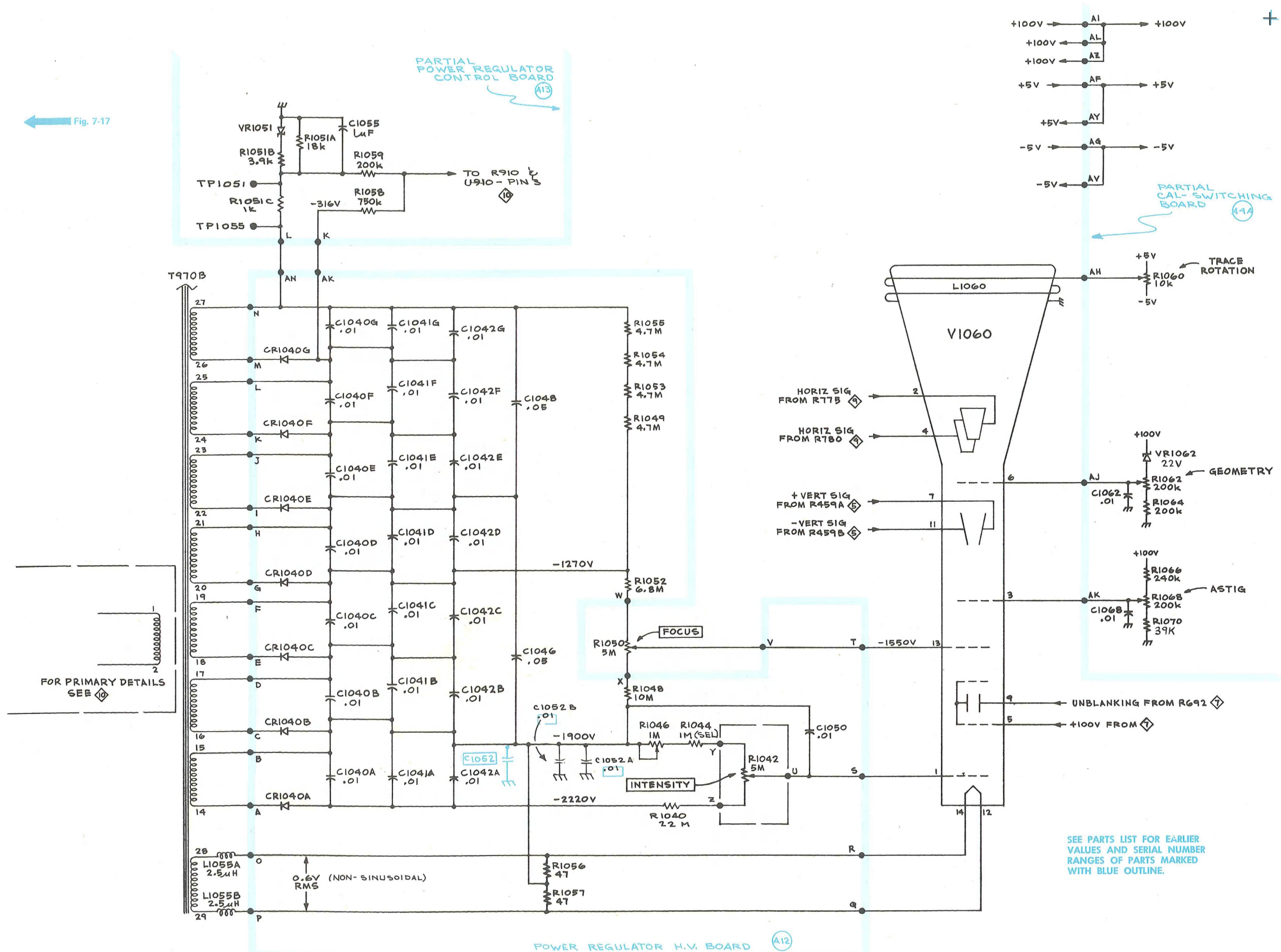


Fig. 7-17. A12 Power Regulator-H.V. board.

Fig. 7-17



326 OSCILLOSCOPE

A1

CRT CIRCUIT

GAB  
173



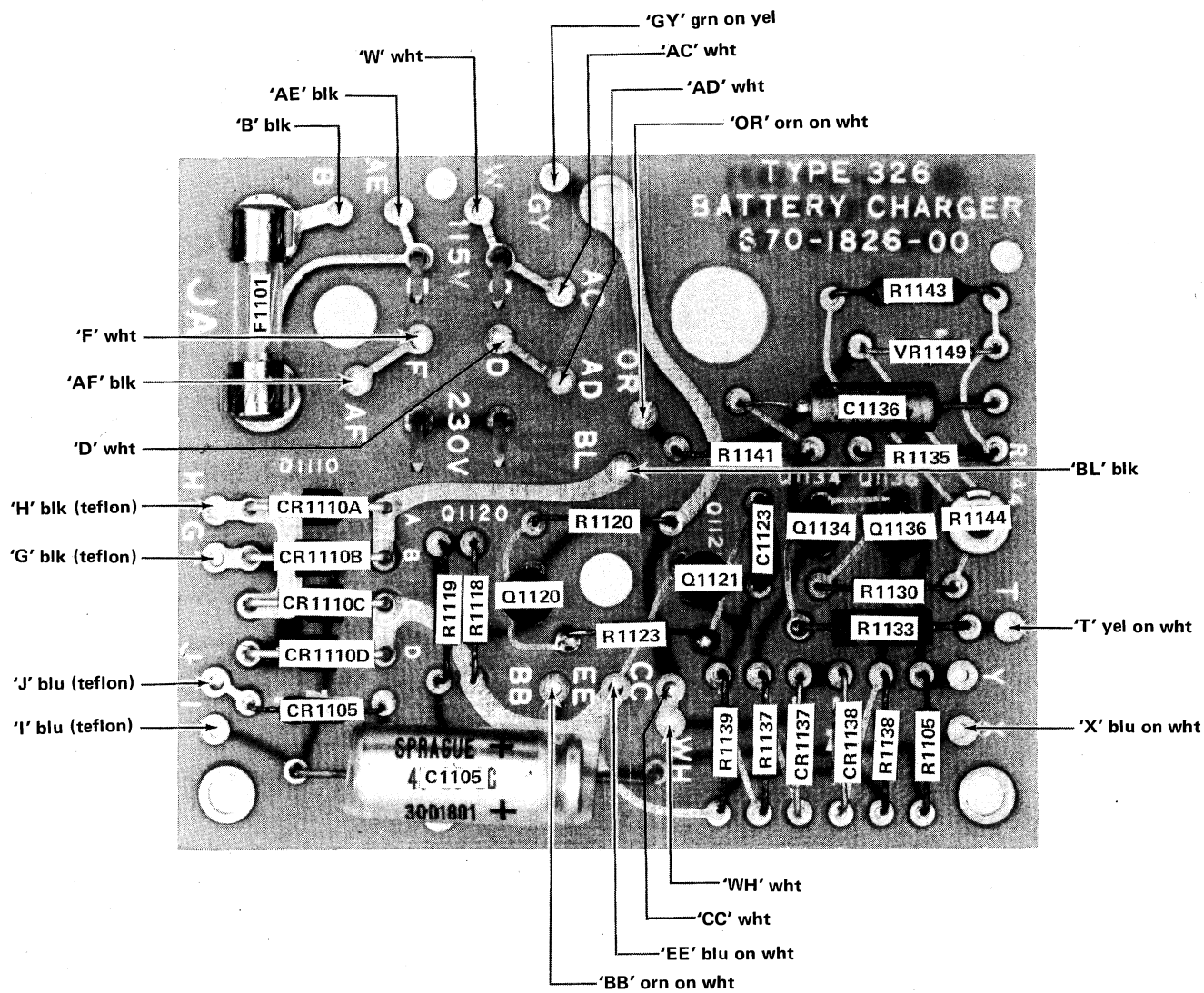
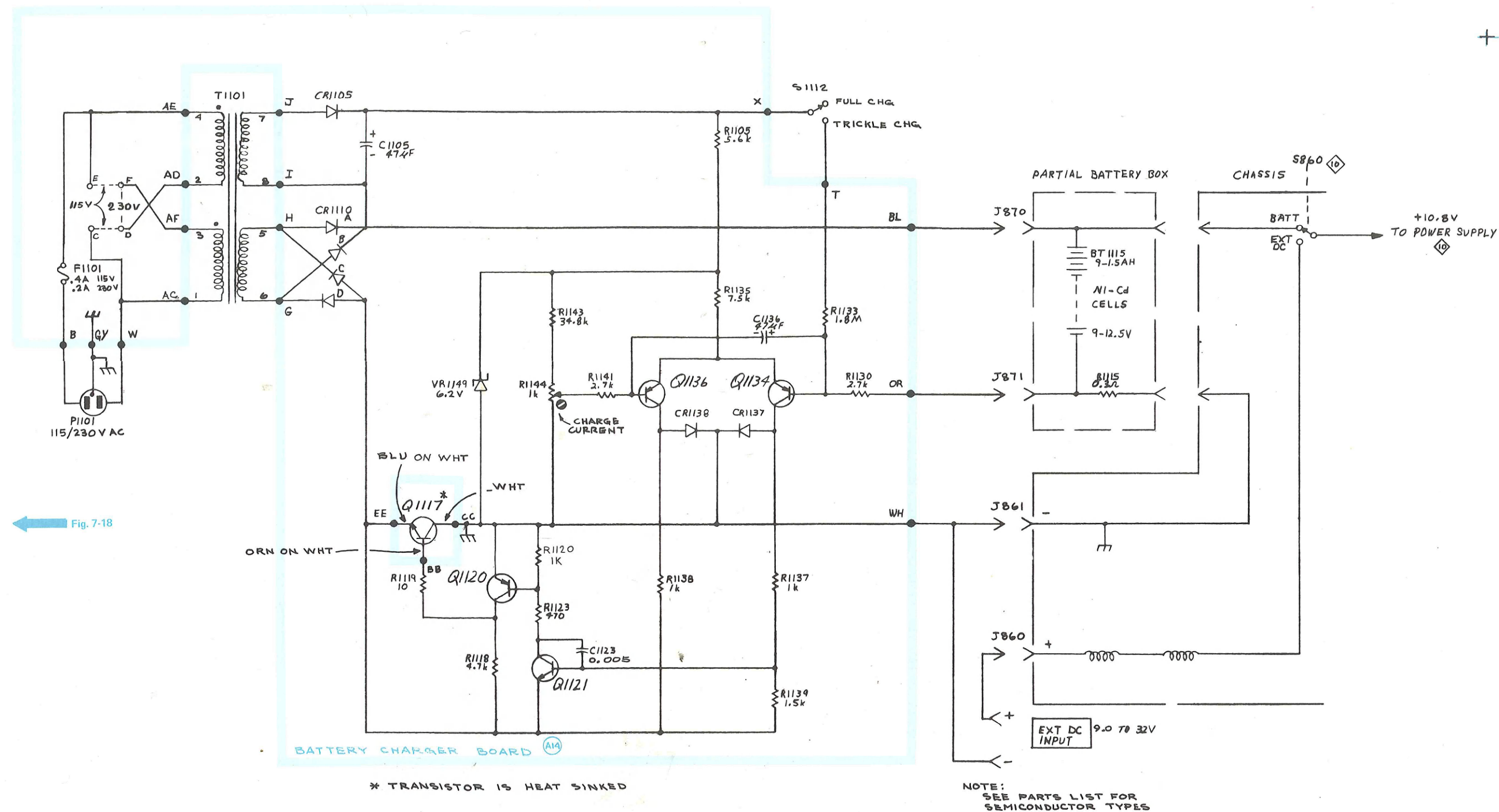


Fig. 7-18. A14 Battery Charger board.





# MECHANICAL PARTS LIST

Replacement parts should be ordered from the Tektronix Field Office or Representative in your area. Changes to Tektronix products give you the benefit of improved circuits and components. Please include the instrument type number and serial number with each order for parts or service.

## ABBREVIATIONS

BHB binding head brass  
BHS binding head steel  
CRT cathode-ray tube  
csk countersunk  
DE double end  
FHB flat head brass  
FHS flat head steel  
Fil HB fillister head brass  
Fil HS fillister head steel

h height or high  
hex. hexagonal  
HHB hex head brass  
HHS hex head steel  
HSB hex socket brass  
HSS hex socket steel  
ID inside diameter  
lg length or long  
OD outside diameter

OHB oval head brass  
OHS oval head steel  
PHB pan head brass  
PHS pan head steel  
RHS round head steel  
SE single end  
THB truss head brass  
THS truss head steel  
w wide or width

## INSTRUMENT

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y	Description
		Eff	Disc		
1-1	390-0253-00			1	CABINET TOP
	- - - - -			-	mounting hardware: (not included w/cabinet top)
-2	211-0007-00	300500	300655	1	SCREW, 4-40 x 0.188 inch, PHS
	211-0065-00	300500	300655	3	SCREW, 4-40 x 0.188 inch, PHS
	213-0284-00	300656		4	SCREW, 4-40 x 4.50 mm, PHS
	- - - - -			- - - - *	- - - - -
-3	342-0141-00			1	INSULATION, mylar
-4	200-1342-00			2	COVER, handle
-5	367-0157-00			1	HANDLE, carrying
	- - - - -			-	mounting hardware: (not included w/handle)
-6	212-0004-00			2	SCREW, 8-32 x 0.312 inch, PHS
-7	210-0008-00			2	WASHER, lock, internal, 0.172 ID x 0.331 inch OD
-8	210-1144-00			2	WASHER, flat, 0.156 ID x 1.125 inches OD
-9	386-2181-00			2	PLATE, ring
-10	386-2182-00			4	PLATE, friction
-11	386-2582-00			4	PLATE, 37 mm diameter
-12	212-0040-00			4	SCREW, 8-32 x 0.375 inch, 100 deg. csk, FHS
-13	384-0834-01			2	SHAFT, handle, friction
	- - - - -			- - - - *	- - - - -
-14	334-1898-00			1	PLATE, identification
-15	390-0254-01			1	CABINET BOTTOM
	- - - - -			-	mounting hardware: (not included w/cabinet
	- - - - -			-	bottom)
-16	211-0065-00	300500	300655	3	SCREW, 4-40 x 0.188 inch, PHS
	211-0007-00	300500	300655	1	SCREW, 4-40 x 0.188 inch, PHS
	213-0284-00	300656		4	SCREW, 4-40 x 4.50 mm, PHS
	- - - - -			- - - - *	- - - - -
-17	348-0187-00			4	FOOT, cabinet
	426-0871-00			1	FRAME-FILTER ASSEMBLY
	- - - - -			-	frame-filter assembly includes:
-18	426-0870-00			1	FRAME, plastic
-19	378-0706-00			1	FILTER, light

## INSTRUMENT (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q t y						Description
				1	2	3	4	5	
1-20	366-1031-03		3						KNOB, red--VARIABLE
	- - - - -		-						each knob includes:
	213-0153-00		1						SETSCREW, 5-40 x 0.125 inch, HSS
-21	366-1029-00		3						KNOB, gray--VOLTS/DIV & TIME/DIV
	- - - - -		-						each knob includes:
	213-0153-00		2						SETSCREW, 5-40 x 0.125 inch, HSS
-22	366-1379-00		3						KNOB, gray--POSITION
	- - - - -		-						each knob includes:
	213-0239-00		1						SETSCREW, 3-48 x 0.062 inch, HSS
-23	366-0379-00		1						KNOB, gray--MODE
	- - - - -		-						knob includes:
	213-0153-00		1						SETSCREW, 5-40 x 0.125 inch, HSS
-24	366-1039-00		1						KNOB, gray--LEVEL/SLOPE
	- - - - -		-						knob includes:
	213-0153-00		1						SETSCREW, 5-40 x 0.125 inch, HSS
-25	366-1023-01		2						KNOB, gray--INTENSITY & FOCUS
	- - - - -		-						each knob includes:
	213-0153-00		1						SETSCREW, 5-40 x 0.125 inch, HSS
-26	214-1700-00		1						SPRING, flat
-27	200-1341-00		2						COVER, variable resistor
-28	- - - - -		2						RESISTOR, variable
	- - - - -		-						mounting hardware for each: (not included
	- - - - -		-						w/resistor)
-29	210-0583-00		1						NUT, hex., 0.25-32 x 0.312 inch
-30	210-0940-00		1						WASHER, flat, 0.25 ID x 0.375 inch OD
-31	210-0046-00		1						WASHER, lock, internal, 0.261 ID x 0.40 inch OD
	- - - - -		-						* - - - -
-32	262-0957-00	300500	1						SWITCH, rotary--TRIGGERING, wired
	262-0957-01	300886	1						SWITCH, rotary--TRIGGERING, wired
	- - - - -		-						switch includes:
	260-0886-00		1						SWITCH, rotary, unwired
-33	376-0051-00		1						COUPLING, flexible
	- - - - -		-						coupling includes:
	354-0251-00		2						RING, coupling
	376-0049-00		1						COUPLING, plastic
	213-0048-00		4						SETSCREW, 4-40 x 0.125 inch, HSS
-34	- - - - -		1						RESISTOR, variable, w/hardware
	- - - - -		-						mounting hardware: (not included w/resistor)
-35	210-0046-00		1						WASHER, lock, internal, 0.261 ID x 0.40 inch OD
	- - - - -		-						mounting hardware: (not included w/switch)
-36	210-0413-00		1						NUT, hex., 0.375-32 x 0.50 inch
-37	210-0840-00		1						WASHER, flat, 0.39 ID x 0.562 inch OD
-38	354-0427-00		1						RING, sleeve
	210-1085-00		1						WASHER, flat, 0.375 ID x 0.75 inch OD
	210-0012-00		1						WASHER, lock, internal, 0.375 ID x 0.50 inch OD
	- - - - -		-						* - - - -
-39	260-0834-00		1						SWITCH, toggle--POWER
	- - - - -		-						mounting hardware: (not included w/switch)
-40	210-0562-00		1						NUT, hex., 0.25-40 x 0.312 inch
	210-0940-00		1						WASHER, flat, 0.25 ID x 0.375 inch OD
	210-0046-00		1						WASHER, lock, internal, 0.261 ID x 0.40 inch OD

				INSTRUMENT (cont)						
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y						Description
		Eff	Disc		1	2	3	4	5	
1-41	343-0119-00			1						CLAMP, cable, 0.094 inch diameter
	- - - - -			-						mounting hardware: (not included w/clamp)
-42	211-0073-00			1						SCREW, 2-56 x 0.218 inch, PHS
	210-0994-00			1						WASHER, flat, 0.125 ID x 0.25 inch OD
	- - - - *									
-43	- - - - -			1						RESISTOR, variable, w/hardware
	- - - - -			-						mounting hardware: (not included w/resistor)
-44	210-0940-00			1						WASHER, flat, 0.25 ID x 0.375 inch OD
	210-0046-00			1						WASHER, lock, internal, 0.261 ID x 0.40 inch OD
-45	407-1043-00			1						BRACKET, variable resistor
-46	129-0378-00			1						POST
	- - - - *									
-47	260-0905-03			1						SWITCH, slide--X10 HORIZ MAG
	- - - - -			-						mounting hardware: (not included w/switch)
-48	211-0079-00			2						SCREW, 2-56 x 0.188 inch, PHS
-49	210-0001-00			2						WASHER, lock, internal, 0.092 ID x 0.18 inch OD
	- - - - *									
	672-0040-00			1						CIRCUIT BOARD ASSEMBLY--TRIGGER SWEEP/TIMING
	- - - - -			-						circuit board assembly includes:
-50	- - - - -			-						CIRCUIT BOARD ASSEMBLY--TRIGGER SWEEP (See A8
	- - - - -			-						Electrical List)
	- - - - -			-						circuit board assembly includes:
-51	136-0252-04			45						SOCKET, pin connector
-52	131-0604-00			23						CONTACT, electrical (See Maintenance Section
	- - - - -			-						for repair)
	105-0301-00			1						ACTUATOR ASSEMBLY--TIME/DIV
	- - - - -			-						actuator includes:
-53	200-1324-00			1						COVER
	- - - - -			-						mounting hardware: (not included w/cover)
-54	211-0022-00			4						SCREW, 2-56 x 0.188 inch, PHS
-55	210-0001-00			4						WASHER, lock, internal, 0.092 ID x 0.18
	- - - - -			-						inch OD
-56	210-0405-00			4						NUT, hex., 2-56 x 0.188 inch
	- - - - *									
-57	354-0219-00			1						RING, retaining
-58	214-1139-00 <sup>1</sup>			-						SPRING, flat, gold
	214-1139-02 <sup>1</sup>			-						SPRING, flat, green
	214-1139-03 <sup>1</sup>			-						SPRING, flat, red
-59	214-1127-00			1						ROLLER, detent
-60	401-0054-00			1						BEARING, front
-61	407-0653-00			1						BRACKET
-62	105-0303-00			1						DRUM ASSEMBLY
-63	401-0056-00			1						BEARING, rear
-64	210-0406-00			6						NUT, hex., 4-40 x 0.188 inch
	- - - - -			-						mounting hardware: (not included
	- - - - -			-						w/actuator assembly)
-65	211-0116-00			6						SCREW, sems, 4-40 x 0.312 inch, PHB

<sup>1</sup>Replace only with part bearing the same color code as the original part in your instrument.

## INSTRUMENT (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q † y	1 2 3 4 5					Description
1-66	- - - - -		1						RESISTOR, variable, w/hardware
	- - - - -		-						mounting hardware: (not included w/resistor)
-67	386-2176-00		1						PLATE, mounting
	210-0046-00		1						WASHER, lock, internal, 0.261 ID x 0.40
	- - - - -		-						inch OD
									- - - * - - -
-68	344-0237-01		1						CLIP, grounding
-69	361-0466-00		1						SPACER, plastic
-70	361-0452-00		1						SPACER
	- - - - -		-						mounting hardware: (not included w/spacer)
-71	211-0116-00		1						SCREW, sems, 4-40 x 0.312 inch, PHB
	- - - - -		-						mounting hardware: (not included w/circuit
	- - - - -		-						board assembly)
	211-0116-00		1						SCREW, sems, 4-40 x 0.312 inch, PHB
-72	210-0413-00		1						NUT, hex., 0.375-32 x 0.50 inch
	210-0840-00		1						WASHER, flat, 0.39 ID x 0.562 inch OD
-73	354-0427-00		1						RING, sleeve
									- - - * - - -
-74	- - - - -		1						CIRCUIT BOARD ASSEMBLY--TIMING (See A9
	- - - - -		-						Electrical List)
	- - - - -		-						mounting hardware: (not included w/circuit
	- - - - -		-						board assembly)
-75	210-0406-00		1						NUT, hex., 4-40 x 0.188 inch
	210-0054-00		1						WASHER, lock, split, 0.118 ID x 0.212 inch OD
-76	210-0994-00		1						WASHER, flat, 0.125 ID x 0.25 inch OD
-77	348-0055-00		1						GROMMET, plastic, 0.25 inch diameter
-78	354-0428-00		1						RING, coupling, mode switch
	213-0075-00		6						SETSCREW, 4-40 x 0.094 inch, HSS
-79	354-0426-00		2						RING, coupling, shaft
-80	384-1132-00		1						SHAFT, extension, vert. mode switch
-81	384-0833-00		2						SHAFT, U position, plastic
-82	260-1367-00		1						SWITCH, rotary--MODE, unwired
	- - - - -		-						mounting hardware: (not included w/switch)
-83	210-0583-00		1						NUT, hex., 0.25-32 x 0.312 inch
	210-0940-00		1						WASHER, flat, 0.25 ID x 0.375 inch OD
									- - - * - - -
-84	- - - - -		2						RESISTOR, variable, w/hardware
	- - - - -		-						mounting hardware for each: (not included
	- - - - -		-						w/resistor)
-85	210-0940-00		1						WASHER, flat, 0.25 ID x 0.375 inch OD
	210-0046-00		1						WASHER, lock, internal, 0.261 ID x 0.40 inch OD
									- - - * - - -
-86	407-1037-00		1						BRACKET, variable resistor
-87	260-0905-02		2						SWITCH, slide--X10 VERT GAIN
	- - - - -		-						mounting hardware for each: (not included
	- - - - -		-						w/switch)
-88	211-0073-00		2						SCREW, 2-56 x 0.218 inch, 82 deg. csk, FHS

## INSTRUMENT (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff      Disc	Q t y 1 2 3 4 5					Description
1-89	407-1039-00		1					BRACKET, slide switch
	- - - - -		-					mounting hardware: (not included w/bracket)
-90	211-0101-00		5					SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
	- - - - -		-					* - - - -
-91	407-1038-00		1					BRACKET, support, slide switch
-92	- - - - -		1					CIRCUIT BOARD ASSEMBLY--CAL (See A4A
	- - - - -		-					Electrical List)
	- - - - -		-					circuit board assembly includes:
-93	337-1740-00		1					SHIELD, electrical, angle, w/power switch hole
-94	337-1621-00		1					SHIELD, electrical, calibrator
-95	337-1683-00		1					SHIELD, electrical, cal switch
-96	- - - - -		1					CIRCUIT BOARD ASSEMBLY--ATTENUATOR (See A4B
	- - - - -		-					Electrical List)
	- - - - -		-					circuit board assembly includes:
-97	136-0252-04		21					SOCKET, pin connector
-98	131-0604-00		38					CONTACT, electrical (See Maintenance Section
	- - - - -		-					for repair)
-99	337-1613-01		1					SHIELD, electrical
	- - - - -		-					mounting hardware: (not included w/shield)
-100	211-0079-00		7					SCREW, 2-56 x 0.188 inch, PHS
-101	210-0001-00		7					WASHER, lock, internal, 0.092 ID x 0.18
	- - - - -		-					inch OD
	- - - - -		-					* - - - -
-102	344-0239-01		2					CLIP, grounding
-103	- - - - -		2					RESISTOR, variable, w/hardware
	- - - - -		-					mounting hardware for each: (not included
	- - - - -		-					w/resistor)
-104	210-0940-00		1					WASHER, flat, 0.25 ID x 0.375 inch OD
-105	386-2183-00		1					PLATE, mounting
-106	210-0046-00		1					WASHER, lock, internal, 0.261 ID x 0.40 inch OD
	- - - - -		-					* - - - -
-107	337-1618-00		1					SHIELD, electrical
	- - - - -		-					mounting hardware: (not included w/shield)
-108	211-0079-00		2					SCREW, 2-56 x 0.188 inch, PHS
	- - - - -		-					* - - - -
-109	337-1622-00		1					SHIELD, electrical
-110	337-1619-00		1					SHIELD, electrical
	105-0302-00		2					ACTUATOR ASSEMBLY--VOLTS/DIV
	- - - - -		-					each actuator assembly includes:
	200-1323-00		1					COVER
	- - - - -		-					mounting hardware: (not included w/cover)
	211-0022-00		2					SCREW, 2-56 x 0.188 inch, PHS
	210-0001-00		2					WASHER, lock, internal, 0.092 ID x 0.18 inch OD

## INSTRUMENT (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q t y						Description
				1	2	3	4	5	
1-111	354-0219-00		1						RING, retaining
-112	214-1126-00 <sup>1</sup>		-						SPRING, flat, gold
	214-1126-02 <sup>1</sup>		-						SPRING, flat, red
	214-1126-03 <sup>1</sup>		-						SPRING, flat, green
-113	214-1127-00		1						ROLLER, detent
-114	401-0053-00		1						BEARING, front
-115	210-0405-00		2						NUT, hex., 2-56 x 0.188 inch
-116	105-0304-00		1						DRUM ASSEMBLY
-117	401-0061-00		1						BEARING, rear
-118	407-0714-00		1						BRACKET, grounding
-119	211-0116-00		4						SCREW, sems, 4-40 x 0.312 inch, PHB
-120	210-0406-00		4						NUT, hex., 4-40 x 0.188 inch
	- - - - -		-						mounting hardware: (not included w/circuit
	- - - - -		-						board assembly)
-121	211-0116-00		1						SCREW, sems, 4-40 x 0.312 inch, PHB
-122	352-0311-01		1						HOLDER, double angle
-123	210-0413-00		2						NUT, hex., 0.375-32 x 0.50 inch
-124	210-0840-00		2						WASHER, flat, 0.39 ID x 0.562 inch OD
-125	354-0427-00		2						RING, sleeve
	- - - - -		-						* - - - -
-126	366-1377-00		1						KNOB, w/extension--INVERT
-127	384-1133-01		1						SHAFT, extension
	- - - - -		-						mounting hardware: (not included w/shaft)
-128	211-0001-00		2						SCREW, 2-56 x 0.25 inch, PHS
-129	210-0001-00		2						WASHER, lock, internal, 0.092 ID x 0.18 inch OD
-130	129-0359-01		1						POST, CH 2 invert switch
-131	376-0135-00		1						COUPLER, invert switch
	- - - - -		-						* - - - -
-132	333-1547-00		1						PANEL, front
-133	131-0251-00		1						CONNECTOR, terminal jack
-134	200-0609-00		1						BASE, lampholder
-135	378-0541-00		1						LENS, indicator light
-136	352-0084-01		1						HOLDER
-137	- - - - -		1						CIRCUIT BOARD ASSEMBLY, switch--TRIG. SOURCE
	- - - - -		-						(See A6 Electrical List)
	- - - - -		-						mounting hardware: (not included w/circuit
	- - - - -		-						board assembly)
-138	211-0156-00		1						SCREW, 1-72 x 0.25 inch, 82 deg. csk, FHS
	- - - - -		-						* - - - -
-139	- - - - -		1						CIRCUIT BOARD ASSEMBLY, switch--TRIG. SOURCE
	- - - - -		-						COUPLING (See A7 Electrical List)
	- - - - -		-						mounting hardware: (not included w/circuit
	- - - - -		-						board assembly)
	211-0156-00		2						SCREW, 1-72 x 0.25 inch, 82 deg. csk, FHS
	- - - - -		-						* - - - -
-140	- - - - -		-						CIRCUIT BOARD ASSEMBLY--AC DC CH-1 (See A1
	- - - - -		-						Electrical List)
	- - - - -		-						mounting hardware: (not included w/circuit
	- - - - -		-						board assembly)
	211-0156-00		1						SCREW, 1-72 x 0.25 inch, 82 deg. csk, FHS

<sup>1</sup> Replace only with part bearing the same color code as the original part in your instrument.

				INSTRUMENT (cont)						
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y						Description
		Eff	Disc		1	2	3	4	5	
1-141	- - - - -			1						CIRCUIT BOARD ASSEMBLY, switch--AC DC CH-2
	- - - - -			-						(See A2 Electrical List)
	- - - - -			-						mounting hardware: (not included w/circuit
	- - - - -			-						board assembly)
	211-0156-00			1						SCREW, 1-72 x 0.25 inch, 82 deg. csk, FHS
										- - - * - - -
-142	407-1042-00			1						BRACKET, slide switch
	- - - - -			-						mounting hardware: (not included w/bracket)
-143	211-0101-00			3						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
										- - - * - - -
-144	331-0301-00			1						MASK, CRT
-145	342-0140-00			1						INSULATOR, mylar, CRT TOP
-146	348-0031-00			1						GROMMET, plastic
-147	334-1379-00			1						LABEL, CRT
-148	342-0145-00			1						INSULATOR, mylar, CRT shield bottom
-149	337-1620-00			1						SHIELD, CRT
-150	386-2177-01			1						SUBPANEL, front
-151	426-0873-01			1						FRAME SECTION, cabinet left
	- - - - -			-						mounting hardware: (not included w/frame
	- - - - -			-						section)
-152	211-0502-00			4						SCREW, 6-32 x 0.188 inch, 100 deg. csk, FHS
										- - - * - - -
-153	426-0869-01			1						FRAME SECTION, cabinet right
	- - - - -			-						mounting hardware: (not included w/frame
	- - - - -			-						section)
-154	211-0502-00			4						SCREW, 6-32 x 0.188 inch, 100 deg. csk, FHS
										- - - * - - -
-155	386-1316-00			1						SUPPORT, CRT
-156	352-0303-00			1						HOLDER, angle, circuit board
	- - - - -			-						mounting hardware: (not included w/holder)
-157	211-0101-00			1						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
										- - - * - - -
-158	179-1792-00			1						WIRING HARNESS, CRT
	- - - - -			-						wiring harness includes:
	136-0266-01			1						SOCKET, CRT
-159	179-1793-00			1						WIRING HARNESS, Position CH-1
	179-1794-00			1						WIRING HARNESS, Position CH-2
	179-1795-00			1						WIRING HARNESS, Mode Switch
	179-1797-00			1						WIRING HARNESS, Horizontal Position
	179-1800-01	300500	300885	1						WIRING HARNESS, Trigger
	179-1800-02	300886		1						WIRING HARNESS, Trigger
	179-1801-01			1						WIRING HARNESS, Timing
	179-1796-00			1						WIRING HARNESS, Trigger Switch
	179-1798-00			1						WIRING HARNESS, Power Control
	179-1802-00	300500	300606X	1						WIRING HARNESS, Low Battery Switch
	179-1803-00			1						WIRING HARNESS, Preamp
	179-1804-00			1						WIRING HARNESS, Power Input
	179-1805-00			1						WIRING HARNESS, Low Voltage Output
-160	348-0296-00			4						FOOT, rear, plastic
	- - - - -			-						mounting hardware for each: (not included w/foot)
-161	213-0285-00			1						SCREW, foot



				INSTRUMENT (cont)						
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y						Description
		Eff	Disc		1	2	3	4	5	
1-162	333-1548-02			1						PANEL, rear
-163	386-2178-01			1						SUBPANEL, rear
-164	136-0490-00			1						SOCKET, banana jack, red
	- - - - -			-						mounting hardware: (not included w/socket)
-165	210-0583-00			1						NUT, hex., 0.25-32 x 0.312 inch
	210-0223-00			1						TERMINAL, lug, 0.25 inch diameter, SE
-166	210-0898-00			1						WASHER, insulating, red
	- - - - -						*			
-167	136-0491-00			1						SOCKET, banana jack, charcoal
	- - - - -			-						mounting hardware: (not included w/socket)
-168	210-0583-00			1						NUT, hex., 0.25-32 x 0.312 inch
	210-0223-00			1						TERMINAL, lug, 0.25 inch
-169	210-0895-00			1						WASHER, insulating, black
	- - - - -						*			
-170	260-1372-00			1						SWITCH, slide
	- - - - -			-						mounting hardware: (not included w/switch)
-171	211-0073-00	300500	300505	2						SCREW, 2-56 x 0.219 inch, 82 deg. csk, FHS
	211-0112-00	300506		2						SCREW, 2-56 x 0.375 inch, 100 deg. csk, FHS
	- - - - -						*			
-172	386-2179-00			1						PLATE, subpanel, rear
	- - - - -			-						mounting hardware: (not included w/plate)
-173	211-0541-00			2						SCREW, 6-32 x 0.25 inch, 100 deg. csk, FHS
	- - - - -						*			
-174	- - - - -			1						CIRCUIT BOARD ASSEMBLY--VERTICAL OUTPUT (See
	- - - - -			-						A5 Electrical List)
	- - - - -			-						circuit board assembly includes:
-175	136-0252-04			39						SOCKET, pin connector
	- - - - -			-						mounting hardware: (not included w/circuit
	- - - - -			-						board assembly)
-176	211-0116-00			3						SCREW, sems, 4-40 x 0.312 inch, PHB
	210-0994-00			1						WASHER, flat, 0.125 ID x 0.25 inch OD
-177	210-0406-00			1						NUT, hex., 4-40 x 0.188 inch
	- - - - -						*			
-178	129-0357-00			1						POST
	- - - - -			-						mounting hardware: (not included w/post)
-179	211-0116-00			1						SCREW, sems, 4-40 x 0.312 inch, PHB
	- - - - -						*			
-180	407-1040-00			1						BRACKET, heatsink
	- - - - -			-						mounting hardware: (not included w/bracket)
-181	211-0101-00			2						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
	- - - - -						*			
-182	214-1354-00			4						HEATSINK
	- - - - -			-						mounting hardware for each: (not included
	- - - - -			-						w/heatsink)
-183	210-0409-00			1						NUT, hex., 8-32 x 0.312 inch
	210-0008-00			1						WASHER, lock, internal, 0.172 ID x 0.331 inch OD

## INSTRUMENT (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q † y						Description
				1	2	3	4	5	
1-184	- - - - -	-	-	-	-	-	-	-	CIRCUIT BOARD ASSEMBLY--HORIZONTAL (See A10 Electrical List)
	- - - - -	-	-	-	-	-	-	-	circuit board assembly includes:
-185	136-0252-04		87						SOCKET, pin connector
-186	214-0283-00		2						CONTACT, electrical
-187	337-1614-00		1						SHIELD, electrical
	- - - - -	-	-	-	-	-	-	-	mounting hardware: (not included w/circuit board assembly)
-188	211-0116-00		3						SCREW, sems, 4-40 x 0.312 inch, PHB - - - * - - -
-189	352-0302-00		1						HOLDER, angle, circuit board
-190	352-0301-00		1						HOLDER, angle, circuit board
-191	337-1611-00		1						SHIELD, high voltage
	- - - - -	-	-	-	-	-	-	-	mounting hardware: (not included w/shield)
-192	211-0105-00		4						SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
-193	211-0101-00		4						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS - - - * - - -
-194	348-0031-00		2						GROMMET, plastic, 0.125 inch diameter
-195	348-0055-00		2						GROMMET, plastic, 0.25 inch diameter
	672-0039-00		1						CIRCUIT BOARD ASSEMBLY--POWER REGULATOR
	- - - - -	-	-	-	-	-	-	-	circuit board assembly includes:
-196	- - - - -	-	1						CIRCUIT BOARD ASSEMBLY--CONTROL (See A13 Electrical List)
	- - - - -	-	-	-	-	-	-	-	circuit board assembly includes:
-197	214-0579-00		1						TERMINAL, test point
-198	136-0252-04		46						SOCKET, pin connector
	- - - - -	-	-	-	-	-	-	-	mounting hardware: (not included w/circuit board assembly)
-199	351-0326-00		3						GUIDE POST, lock - - - * - - -
-200	- - - - -	-	1						CIRCUIT BOARD ASSEMBLY--RECTIFIER (See A11 Electrical List)
	- - - - -	-	-	-	-	-	-	-	circuit board assembly includes:
-201	136-0252-04		6						SOCKET, pin connector
	342-0142-00		1						INSULATOR, mylar
-202	351-0325-00		3						GUIDE POST
-203	- - - - -	-	1						CIRCUIT BOARD ASSEMBLY--REGULATOR (See A12 Electrical List)
	- - - - -	-	-	-	-	-	-	-	circuit board assembly includes:
-204	346-0032-00		2						STRAP, mouse tail
	- - - - -	-	-	-	-	-	-	-	mounting hardware: (not included w/circuit board assembly)
-205	211-0116-00		3						SCREW, sems, 4-40 x 0.312 inch, PHB - - - * - - -
-206	- - - - -	-	1						TRANSFORMER
	- - - - -	-	-	-	-	-	-	-	mounting hardware: (not included w/transformer)
-207	210-0406-00		2						NUT, hex., 4-40 x 0.188 inch
	210-0004-00		2						WASHER, lock, internal, 0.12 ID x 0.26 inch OD - - - * - - -
	214-1354-00		1						HEATSINK, transistor (not shown)

				INSTRUMENT (cont)						
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y						Description
		Eff	Disc		1	2	3	4	5	
1-208	129-0360-00			1						POST, plastic
-209	129-0361-00			2						POST
-210	- - - - -			1						CIRCUIT BOARD ASSEMBLY--VERTICAL PRE AMP (See
	- - - - -			-						A3 Electrical List)
	- - - - -			-						circuit board assembly includes:
-211	136-0252-04			111						SOCKET, pin connector
-212	260-1132-02			1						SWITCH, push--INVERT
-213	337-1615-00			1						SHIELD, electrical
-214	337-1616-00			1						SHIELD, electrical
-215	337-1617-00			1						SHIELD, electrical
	- - - - -			-						mounting hardware: (not included w/circuit
	- - - - -			-						board assembly)
-216	211-0116-00			5						SCREW, sems, 4-40 x 0.312 inch, PHB
	- - - - -			-						* - - - -
-217	337-1610-00			1						SHIELD, battery pack top
	- - - - -			-						mounting hardware: (not included w/shield)
-218	211-0101-00			2						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
-219	211-0005-00			3						SCREW, 4-40 x 0.125 inch, PHS
-220	210-0406-00			3						NUT, hex., 4-40 x 0.188 inch
	210-0004-00			3						WASHER, lock, internal, 0.12 ID x 0.26 inch OD
	- - - - -			-						* - - - -
-221	342-0144-00			1						INSULATOR, mylar, battery shield
-222	122-0149-00			1						ANGLE, heatsink mounting
-223	407-1053-00			2						BRACKET, double angle
-224	337-1609-00			1						SHIELD, electrical
	- - - - -			-						mounting hardware: (not included w/shield)
-225	210-0586-00			2						NUT, keps, 4-40 x 0.25 inch
-226	211-0101-00			2						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
-227	211-0105-00			4						SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
	- - - - -			-						* - - - -
-228	337-1699-00			1						SHIELD, magnetic, angle
-229	342-0154-00			1						INSULATOR, mylar, high voltage box
-230	337-1689-00			1						SHIELD, magnetic, high voltage box bottom
-231	352-0304-00			1						HOLDER, angle, circuit board
	- - - - -			-						mounting hardware: (not included w/holder)
-232	211-0105-00			1						SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
	- - - - -			-						* - - - -
-233	255-0334-00			in						PLASTIC CHANNEL, 3 inches long
-234	134-0013-00			2						PLUG, tip, banana type
	- - - - -			-						mounting hardware for each: (not included
	- - - - -			-						w/plug)
-235	211-0510-00			1						SCREW, 6-32 x 0.375 inch, PHS
	210-0203-00			1						LUG, solder, SE #6
-236	210-0811-00			1						WASHER, fiber

				INSTRUMENT (cont)						
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y	1 2 3 4 5					Description
		Eff	Disc							
1-237	386-2184-00			1						PLATE, spacer
	- - - - -			-						mounting hardware: (not included w/plate)
-238	211-0105-00			2						SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
-239	361-0453-00			2						SPACER
	210-0994-00			2						WASHER, flat, 0.125 ID x 0.25 inch OD
	210-0054-00			2						WASHER, lock, split, 0.118 ID x 0.212 inch OD
-240	210-0406-00			2						NUT, hex., 4-40 x 0.188 inch
	- - - - -			-						* - - - -
-241	337-1612-00			1						SHIELD, electrical
	- - - - -			-						mounting hardware: (not included w/shield)
-242	211-0101-00			3						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
	- - - - -			-						* - - - -
-243	441-1067-00			1						CHASSIS, main
-244	342-0143-00			1						INSULATOR, mylar, main chassis
-245	131-0274-00			2						CONNECTOR, BNC, insulated, w/hardware
-246	129-0103-00			1						POST, binding
	- - - - -			-						post includes:
	200-0103-00			1						NUT, knurled, 0.25-28 x 0.375 inch OD
	129-0077-00			1						POST, binding, 0.25-28 x 0.938 inch long
	- - - - -			-						mounting hardware: (not included w/post)
-247	210-0455-00			1						NUT, hex., 0.25-28 x 0.375 inch
	210-0223-00			1						TERMINAL, lug, 0.25 inch diameter, SE
	- - - - -			-						* - - - -
-248	136-0491-00			1						SOCKET, banana jack, charcoal
	- - - - -			-						mounting hardware: (not included w/socket)
-249	210-0465-00			1						NUT, hex., 0.25-32 x 0.375 inch
	210-0223-00			1						TERMINAL, lug, 0.25 inch diameter, SE
	210-0895-00			1						WASHER, insulating, black
-250	337-1635-00			1						SHIELD, electrical
	- - - - -			-						* - - - -
-251	131-0106-00			1						CONNECTOR, receptacle, female BNC, w/hardware
	- - - - -			-						mounting hardware: (not included w/connector)
	210-0255-00			1						TERMINAL, lug, 0.25 inch diameter, SE
	- - - - -			-						* - - - -
-252	260-0905-00			1						SWITCH, slide
	- - - - -			-						mounting hardware: (not included w/switch)
-253	211-0073-00			2						SCREW, 2-56 x 0.218 inch, 82 deg. csk, FHS
	- - - - -			-						* - - - -
-254	391-0098-01			1						BLOCK, input bracket, left
	- - - - -			-						mounting hardware: (not included w/block)
-255	211-0079-00			2						SCREW, 2-56 x 0.188 inch, PHS
	- - - - -			-						* - - - -
-256	391-0097-00	300500	300655	1						BLOCK, input bracket, right
	391-0097-01	300656		1						BLOCK, input bracket, right
	- - - - -			-						mounting hardware: (not included w/block)
-257	211-0079-00			2						SCREW, 2-56 x 0.188 inch, PHS

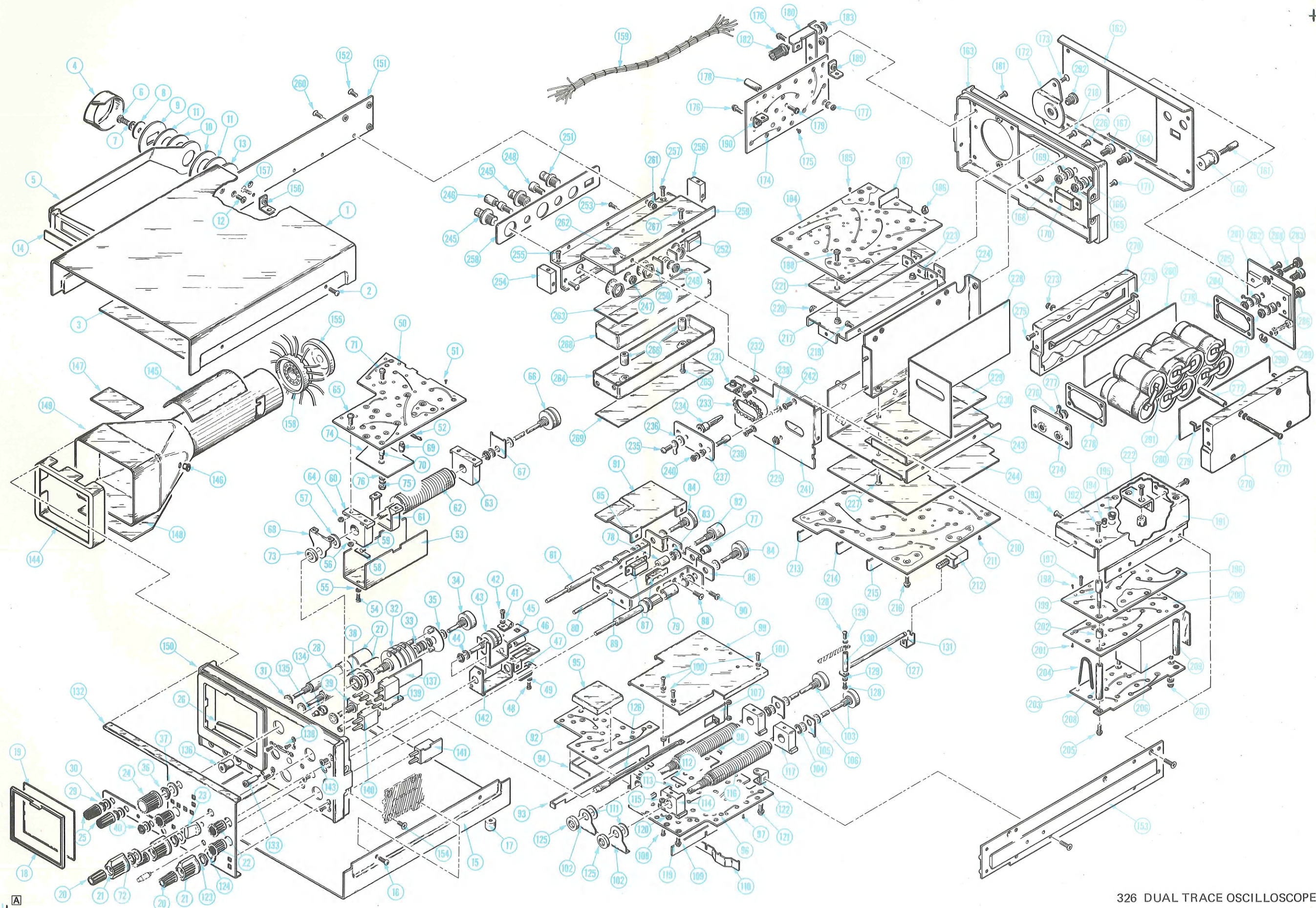
## Mechanical Parts List-326 (SN 300500-up)

				INSTRUMENT (cont)						
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y						Description
		Eff	Disc		1	2	3	4	5	
1-258	333-1549-00			1						PANEL, side
-259	407-1041-00			1						BRACKET, input
	- - - - -			-						mounting hardware: (not included w/bracket)
-260	211-0073-00			3						SCREW, 2-56 x 0.218 inch, 82 deg. csk, FHS
	210-0001-00			3						WASHER, lock, internal, 0.092 ID x 0.18 inch OD
-261	210-0405-00			3						NUT, hex., 2-56 x 0.188 inch
-262	210-0586-00			2						NUT, keps, 4-40 x 0.25 inch
	- - - - -			-						* - - - -
-263	342-0153-00			1						INSULATOR, mylar, delay line
-264	380-0274-00			1						HOUSING, delay line
	- - - - -			-						mounting hardware: (not included w/delay line)
-265	211-0007-00			2						SCREW, 4-40 x 0.188 inch, PHS
-266	129-0362-00			2						POST
-267	211-0105-00			2						SCREW, 4-40 x 0.188 inch, 100 deg. csk, FHS
	- - - - -			-						* - - - -
-268	342-0157-00			1						INSULATOR, cup, delay line
-269	342-0146-00			1						INSULATOR, mylar, delay line
	016-0296-00			1						BATTERY PACK, complete
	- - - - -			-						battery pack includes:
-270	343-0349-00			2						CLAMP, battery retaining
	- - - - -			-						mounting hardware: (not included w/clamp)
-271	211-0194-00			4						SCREW, 4-40 x 47.5 mm, PHS
	210-0054-00			8						WASHER, lock, split, 0.118 ID x 0.212 inch OD
-272	129-0358-00			4						POST, plastic
-273	210-0406-00			4						NUT, hex., 4-40 x 0.188 inch
	- - - - -			-						* - - - -
-274	136-0487-01			1						SOCKET, banana jack, twin
	- - - - -			-						mounting hardware: (not included w/socket)
-275	213-0141-00			4						SCREW, thread forming, 4-40 x 0.25 inch, PHS
	- - - - -			-						* - - - -
-276	210-0223-00			2						TERMINAL, lug, 0.25 inch diameter, SE
	- - - - -			-						mounting hardware for each: (not included
	- - - - -			-						w/terminal)
-277	210-0583-00			1						NUT, hex., 0.25-32 x 0.312 inch
	- - - - -			-						* - - - -
-278	386-2435-00			2						PLATE
-279	344-0238-00			2						CLIP, conductor, battery
-280	342-0139-00	B300500	B300885	2						INSULATOR, mylar
	342-0139-00	B300886		1						INSULATOR, mylar
-281	333-1550-00			1						PANEL, battery pack
	- - - - -			-						mounting hardware: (not included w/panel)
-282	211-0025-00			4						SCREW, 4-40 x 0.375 inch, 100 deg. csk, FHS
	213-0107-00			2						SCREW, thread forming, 4-40 x 0.25 inch,
	- - - - -			-						100 deg. csk, FHS
	- - - - -			-						* - - - -
-283	136-0481-00			1						SOCKET, banana jack, charcoal
	- - - - -			-						mounting hardware: (not included w/socket)
-284	210-0583-00			1						NUT, hex., 0.25-32 x 0.312 inch
	210-0223-00			1						TERMINAL, lug, 0.25 inch diameter, SE
-285	210-0895-00			1						WASHER, insulating, black

				INSTRUMENT (cont)								
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q								Description
		Eff	Disc	t y	1	2	3	4	5			
1-286	136-0490-00			1								SOCKET, banana jack, red
	- - - - -			-								mounting hardware: (not included w/socket)
-287	210-0583-00			1								NUT, hex., 0.25-32 x 0.312 inch
	210-0223-00			1								TERMINAL, lug, 0.25 inch diameter, SE
	210-0898-00			1								WASHER, insulating, red
								*				
-288	213-0283-00			2								THUMBSCREW
	- - - - -			-								mounting hardware for each: (not included
	- - - - -			-								w/thumbcrew)
-289	210-1146-00			1								WASHER, 3.8 mm ID x 7 mm OD
-290	354-0165-00			1								RING, retaining
								*				
-291	146-0018-00			1								BATTERY SET
-292	213-0282-00			1								THUMBSCREW



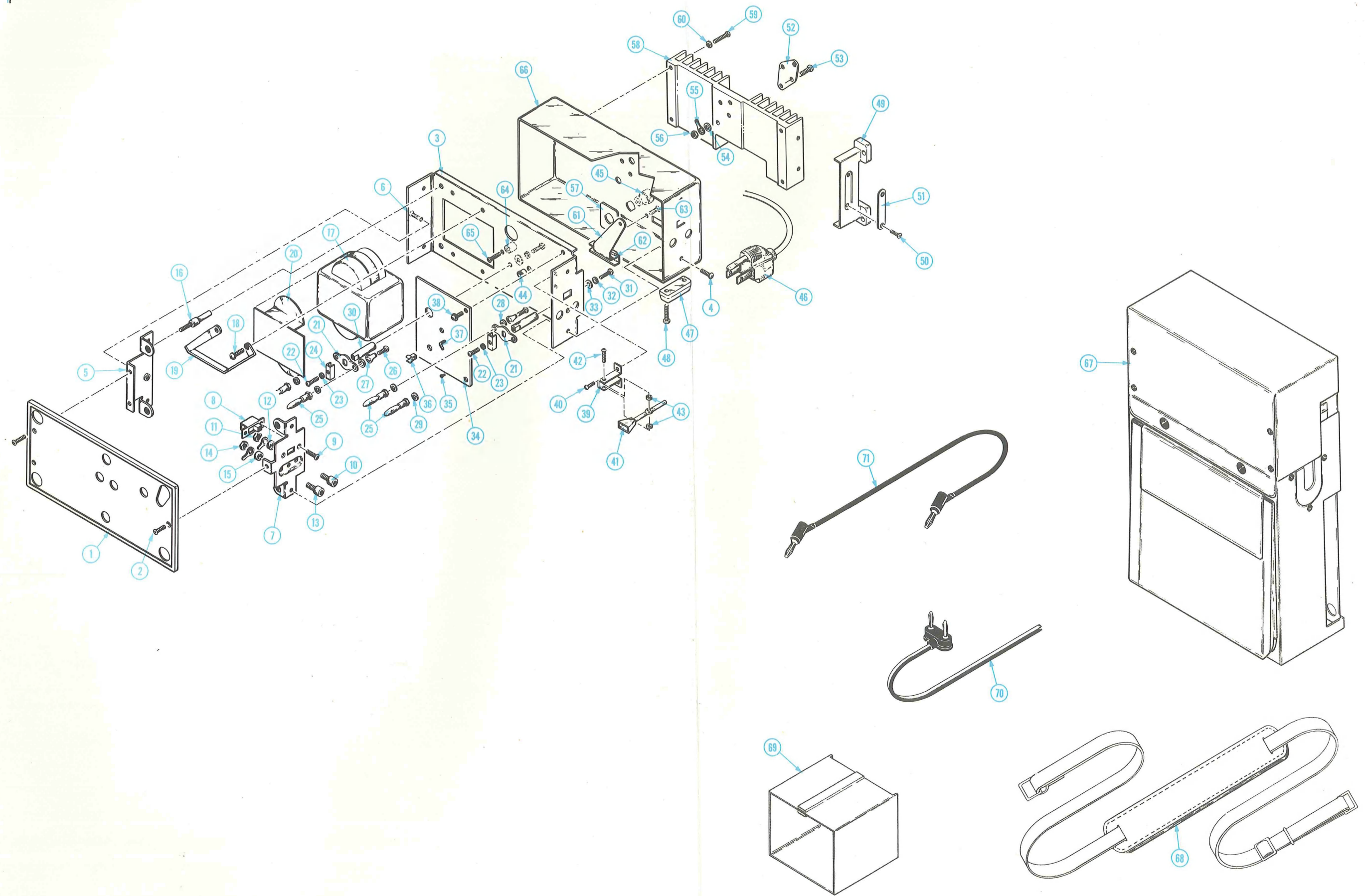




326 DUAL TRACE OSCILLOSCOPE



FIG. 2 BATTERY CHARGER & ACCESSORIES



BATTERY CHARGER  
AND ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q † y						Description
				1	2	3	4	5	
2-	016-0528-00		1						BATTERY CHARGER
-1	426-0925-00		-						battery charger includes:
-2	211-0101-00		1						FRAME, plastic
-3	441-1076-01		-						mounting hardware: (not included w/frame)
-4	211-0008-00		3						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
-5	407-1113-00		-			*			
-6	211-0101-00		1						CHASSIS, battery charger
-7	386-2307-00		-						mounting hardware: (not included w/chassis)
-8	260-0905-01		4						SCREW, 4-40 x 0.25 inch, PHS
-9	211-0073-00		-			*			
-10	136-0490-00		1						BRACKET, double angle
-11	210-0465-00		-						mounting hardware: (not included w/bracket)
-12	210-0223-00		1						SCREW, 4-40 x 0.25 inch, PHS
-13	210-0898-00		-			*			
-14	136-0491-00		1						PLATE, component mounting
-15	210-0465-00		1						SWITCH, slide
-16	210-0223-00		-						mounting hardware: (not included w/switch)
-17	210-0895-00		2						SCREW, 2-56 x 0.218 inch, 82 deg. csk, FHS
-18	211-0635-00		-			*			
-19	337-1673-00		1						SOCKET, banana jack, red
-20	386-2306-00		-						mounting hardware: (not included w/socket)
-21	211-0510-00		1						NUT, hex., 0.25-32 x 0.375 inch
-22	407-1112-00		1						TERMINAL, lug, 0.25 inch diameter
-23			1						WASHER, plastic, 0.375 inch diameter, red
-24			-			*			
			1						SOCKET, banana jack, charcoal
			-						mounting hardware: (not included w/socket)
			1						NUT, hex., 0.25-32 x 0.375 inch
			1						TERMINAL, lug, 0.25 inch diameter
			1						WASHER, plastic, 0.375 inch, charcoal
			-			*			
			4						SCREW, 6-32
			1						TRANSFORMER
			-						mounting hardware: (not included w/transformer)
			4						SCREW, 6-32 x 0.375 inch, PHS
			2						BRACKET, component mounting
			-			*			
			1						SHIELD, magnetic
			2						PLATE, banana plug
			-						mounting hardware for each: (not included
			-						w/plate)
			1						SCREW, 4-40 x 0.25 inch, PHS
			1						WASHER, lock, split, 0.118 ID x 0.212 inch OD
			1						STOP, double angle

BATTERY CHARGER  
AND ACCESSORIES (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y	1	2	3	4	5	Description
		Eff	Disc							
2-25	134-0013-00			4						PLUG, banana
-26	211-0510-00			-						mounting hardware for each: (not included w/plug)
-27	210-0202-00			1						SCREW, 6-32 x 0.375 inch, PHS
-28	210-0935-00			1						TERMINAL, lug, SE #6
-29	210-0812-00			1						WASHER, fiber, 0.14 ID x 0.375 inch OD
				1						WASHER, fiber, 0.188 ID x 0.375 inch OD
								*		
-30	129-0377-00			2						POST
-31	211-0008-00			-						mounting hardware for each: (not included w/post,
-32	210-0004-00			1						SCREW, 4-40 x 0.25 inch, PHS
-33	210-1001-00			1						WASHER, lock, internal, 0.12 ID x 0.26 inch OD
				1						WASHER, flat, 0.119 ID x 0.375 inch OD
								*		
-34	- - - - -			1						CIRCUIT BOARD ASSEMBLY--BATTERY CHARGER (See
	- - - - -			-						A14 Electrical List)
	- - - - -			-						circuit board assembly includes:
-35	136-0252-04			12						SOCKET, pin connector
-36	214-0283-00			2						CONTACT
-37	214-0507-00			4						TERMINAL, pin, 0.24 inch long
	- - - - -			-						mounting hardware: (not included w/circuit
	- - - - -			-						board assembly)
-38	211-0116-00			3						SCREW, sems, 4-40 x 0.312 inch, PHB
								*		
-39	407-1115-00			1						BEARING STAND
	- - - - -			-						mounting hardware: (not included w/bearing
	- - - - -			-						stand)
-40	211-0079-00	B300500	B300655	2						SCREW, 2-56 x 0.188 inch, PHS
	211-0108-00	B300656		2						SCREW, 2-56 x 0.156 inch, PHS
								*		
-41	352-0325-00			1						HOLDER, slide switch
	- - - - -			-						mounting hardware: (not included w/holder)
-42	211-0062-00			1						SCREW, 2-56 x 0.312 inch, PHS
-43	361-0486-00			2						SPACER
								*		
-44	348-0055-00			1						GROMMET, plastic, 0.25 inch diameter
-45	358-0323-00			1						BUSHING, strain relief
-46	161-0071-02			1						CABLE ASSEMBLY, power
-47	348-0316-00			2						FOOT
	- - - - -			-						mounting hardware for each: (not included
	- - - - -			-						w/foot)
-48	211-0008-00			2						SCREW, 4-40 x 0.25 inch, PHS
	210-0994-00			2						WASHER, flat, 0.125 ID x 0.25 inch OD
								*		
-49	348-0317-00			2						FOOT, w/cord wrap
	- - - - -			-						mounting hardware for each: (not included
	- - - - -			-						w/foot)
-50	211-0101-00			2						SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
-51	386-2310-00			1						PLATE, mounting

BATTERY CHARGER  
AND ACCESSORIES (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y	Description
		Eff	Disc		
2-52	- - - - -			1	TRANSISTOR
	- - - - -			-	mounting hardware: (not included w/transistor)
-53	211-0511-00			2	SCREW, 6-32 x 0.50 inch, PHS
-54	210-0811-00			2	WASHER, fiber
-55	210-0202-00			1	TERMINAL, lug, SE #6
-56	210-0407-00			2	NUT, hex., 6-32 x 0.25 inch
	- - - - *				
-57	386-2308-00			1	PLATE, bushing mounting
-58	214-1739-01			1	HEATSINK
	- - - - -			-	mounting hardware: (not included w/heatsink)
-59	211-0061-00			4	SCREW, 4-40 x 0.50 inch, Fil HS
-60	211-0054-00			4	WASHER, lock, split, 0.118 ID x 0.212 inch OD
	- - - - *				
-61	386-2309-00			1	PLATE, extension, switch
-62	407-1114-00			1	BRACKET, double angle
	- - - - -			-	mounting hardware: (not included w/bracket)
-63	211-0079-00			1	SCREW, 2-56 x 0.188 inch, PHS
	211-0073-00			1	SCREW, 2-56 x 0.218 inch, 82 deg. csk, FHS
	- - - - *				
	366-1409-00			1	KNOB, switch
-64	129-0362-00			1	POST, 4-40 x 8 mm OD x 8.6 mm long
	- - - - -			-	mounting hardware: (not included w/post)
-65	211-0101-00			2	SCREW, 4-40 x 0.25 inch, 100 deg. csk, FHS
	210-0004-00			1	WASHER, lock, internal, 0.12 ID x 0.26 inch OD
	- - - - *				
-66	200-1404-02	B300500	B300655	1	COVER, battery charger
	200-1404-03	B300656	B300705	1	COVER, battery charger
	200-1404-04	B300706		1	COVER, battery charger
	348-0055-00	XB300656		4	GROMMET, plastic, 0.25 inch dia. (not shown)
	210-0201-00	XB300706		1	TERMINAL, lug, SE #4 (not shown)
	- - - - -			-	mounting hardware: (not included w/lug)
	210-0586-00	XB300706		1	NUT, plain, ext w, 4-40 x 0.25 inch, STL
	211-0007-00	XB300706		1	SCREW, machine, 4-40 x 0.188 inch, PNH STL
	- - - - *				

INCLUDED ACCESSORIES

	010-6049-01	2	PROBE PACKAGE, P6049A, w/accessories
-67	016-0532-00	1	CARRYING CASE
-68	346-0098-00	1	STRAP ASSEMBLY
-69	016-0297-00	1	VIEWING HOOD
	426-0871-00	1	FRAME-FILTER ASSEMBLY (See Fig 1 ref. #18 & 19)
-70	012-0406-00	1	CABLE ASSEMBLY, external, DC
-71	012-0039-00	1	TEST LEAD, 18 inches long
	103-0013-00	1	ADAPTER, 3 wire to 2 wire
	159-0097-00	3	FUSE, fast-blo, 0.40 amp
	159-0098-00	2	FUSE, fast-blo, 1.60 amp
	159-0100-00	3	FUSE, fast-blo, 0.20 amp

OPTIONAL ACCESSORIES

	103-0033-00	1	ADAPTER, connector, BNC to binding post
	016-0296-00	1	BATTERY PACK, complete
	146-0018-00	1	BATTERY SET

## **MANUAL CHANGE INFORMATION**

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Sections of the manual are often printed at different times, so some of the information on the change pages may already be in your manual. Since the change information sheets are carried in the manual until ALL changes are permanently entered, some duplication may occur. If no such change pages appear in this section, your manual is correct as printed.

**TEKTRONIX®**committed to  
technical excellence**MANUAL CHANGE INFORMATION**PRODUCT GENERALCHANGE REFERENCE S23351DATE 4-10-75**CHANGE:****DESCRIPTION****POWER CORD CHANGES**

The 1974 National Electrical Code permits the use of IEC (International Electrotechnical Commission) power cord color codes. As production permits, we are changing the entire Tektronix product line to comply with IEC power cord color code requirements. As a result, the power cord on Tektronix instruments may conform to either IEC or the older NEC requirements.

The change consists of the following:

Conductor	NEC	IEC
Line	Black	Brown
Neutral	White	Light Blue*
Safety Earth	Green w/Yellow Stripe	Green w/Yellow Stripe

\*Tinned copper conductor.

326 EFF SN 301463-up

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

C454

283-0080-00

0.022  $\mu$ F, Cer, 25 V, +80%-20%

(See Diagram 5)

326. EFF SN 301206-up

MECHANICAL PARTS LIST CHANGES

Page 8-7

CHANGE TO:

Fig. 1-158	179-1792-00	300500-301205	1 WIRING HARNESS, CRT
1-158	179-1792-01	301206	1 WIRING HARNESS, CRT